JANUARY 24, 1931

Railway Age

Founded In 1856

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CLAIMS!

WHY?

BECAUSE IT IS NOT ONE OF 200,000 CARS EQUIPPED WITH WINE DROP DOOR LOCKS

IF YOU ARE USING WINE LOCKS ON YOUR CARS — COMPARE THE DIFFERENCE IN COAL CLAIMS SINCE THEY WERE FIRST APPLIED.

IF YOU ARE *NOT* USING WINE LOCKS — COMPARE YOUR CLAIMS WITH THOSE OF A ROAD ON WHICH WINE LOCKS ARE STANDARD.

Peoples Gas Bldg.
Chicago

The Wine Railway Appliance Co.
TOLEDO, OHIO

Munsey Bldg.
Washington, D. C.

Alphabetical Index to Advertisers—Page 50

Buyers Directory of Advertisers—Page 43

Length by the yard-stick...but *VALUE* by the *YEAR-STICK!*

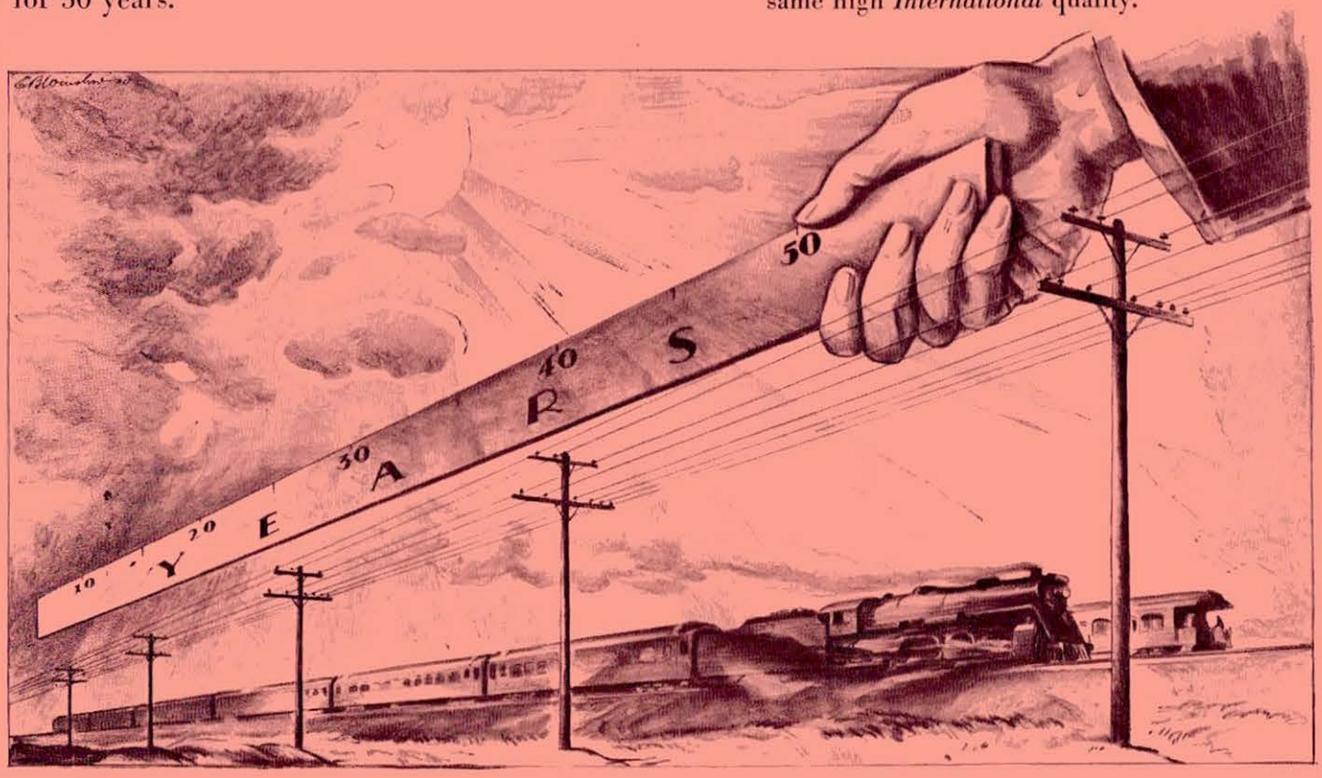
POLES that measure longer in years — such as International Creosoted Yellow Pine Poles — are poles that measure up stronger every year of their life. Protected from decay and made of the strongest of pole woods, International poles offer the greatest resistance to storm damage. Hardware holds firmer, and the poles are safer for linemen to climb.

An interesting feature of Creosoted Pine Poles is their resistance to fire. This feature makes these poles especially valuable for use in grasslands or along railroad lines.

But that's not all. Behind every International pole stands a reputation for quality, integrity, and promptness that has been International's for 50 years.

Prompt Service ...an International pledge...

An important part of the story of International is promptness of service. Because of International's large stock of poles always on hand—plus the availability of International's more than adequate crew of skilled pole framers — this company can be depended upon to make shipments quickly and carefully. And in every pole shipped, one can expect the same high *International* quality.



International

CREOSOTING & CONSTRUCTION CO.

PRODUCERS OF CREOSOTED YELLOW PINE POLES

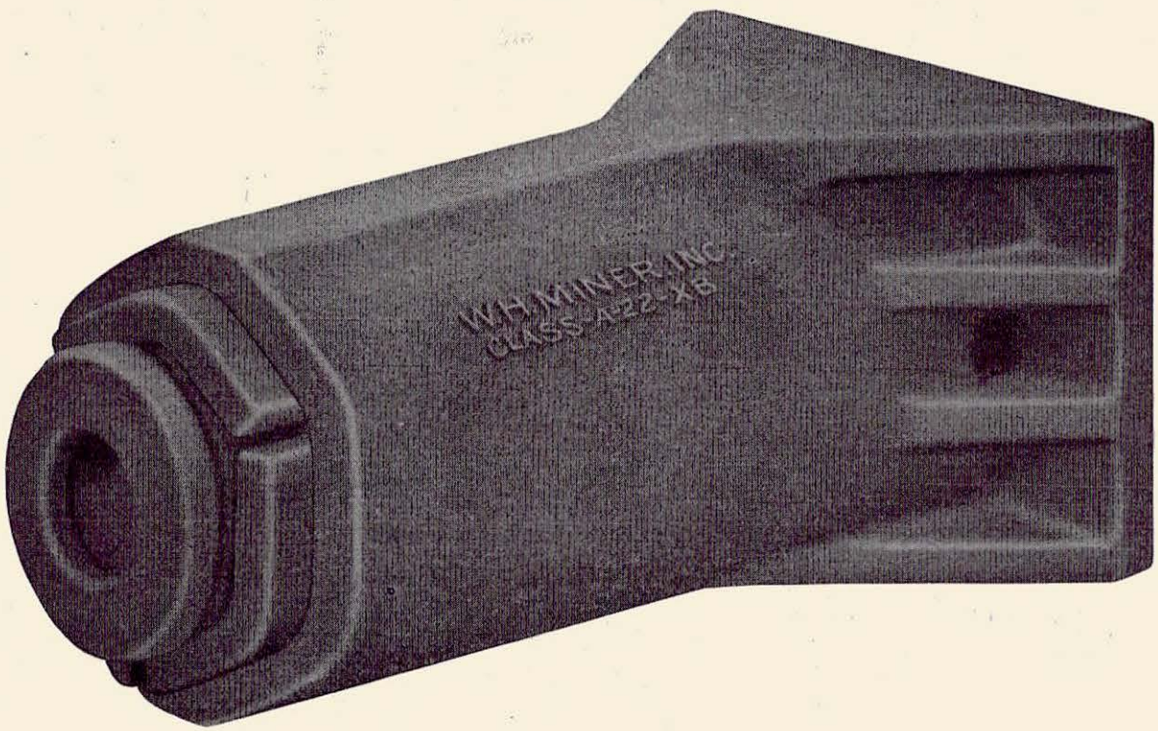
Galveston · Beaumont · Texarkana

DISTRIBUTED BY GRAYBAR

Published weekly by Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa. Entered as second class matter, March 9, 1928, at the Post Office at East Stroudsburg, Pa., under the act of March 3, 1879.
Address communications to 30 Church St., New York City.

MINER

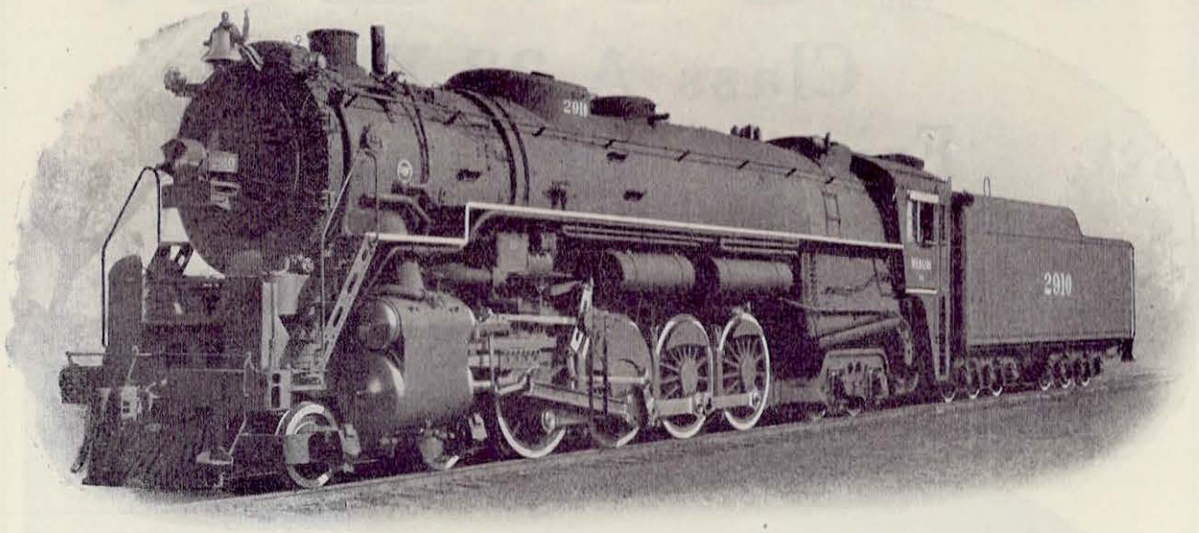
Class A-22-XB
Friction Draft Gear



Exceeds the A. R. A. Requirements for Certified Draft Gears

W. H. MINER, INC.
CHICAGO

High Capacity Locomotives For Fast Freight Service



4-8-4 TYPE LOCOMOTIVE
WABASH RAILWAY

Cylinders	27″ x 32″
Drivers, diameter	70″
Steam pressure	250 lb.
Grate area	96.2 sq. ft.
Water heating surface	5189 sq. ft.
Superheating surface	2360 sq. ft.
Weight on drivers	274,100 lb.
Weight, total engine	454,090 lb.
Tractive force	70,750 lb.

TWENTY-FIVE locomotives of the 4-8-4 type, recently built at these Works for the Wabash Railway, are fine representatives of a class of power that is successfully meeting the present-day demands of heavy, fast freight traffic.

With a starting tractive force of 70,750 pounds, driving wheels 70 inches in diameter, and ample boiler power, these locomotives can start heavy trains; have horsepower capacity to accelerate them rapidly and maintain speed on long runs.

These same qualities make this design suitable for heavy passenger service should it be found necessary to use the locomotives in such work.

THE BALDWIN LOCOMOTIVE WORKS ★ 1831 1931

Present-day service conditions demand present-day motive power. While this may mean the discarding of locomotives still in good condition, the result will be economy.

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

Published every Saturday by the Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa., with executive offices at 30 Church Street, New York

All communications should be addressed to the New York Office, 30 Church Street

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WASHINGTON:
17th and H Streets, N. W.

CLEVELAND:
Terminal Tower

SAN FRANCISCO:
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The Railway Age is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.)

Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free; United States, Mexico and Canada, $6.00. Foreign countries, not including daily editions $8.00.

Subscriptions for the fourth issue each month only (published in two sections, the second of which is the Motor Transport Section) payable in advance and postage free; United States, Mexico and Canada, $1.00; foreign countries, $2.00. Single copies, 25 cents each.

Railway Age

With which are incorporated the Railway Review, the Railroad Gazette and the Railway Age-Gazette. Name Registered U. S. Patent Office.

Vol. 90 January 24, 1931 No. 4

In This Issue

Colonial Design Embodied in New Northern Pacific Station . . . Page 227

Lowry Smith, office engineer of this road at St. Paul, Minn., describes its new passenger facilities at Mandan, N. D., which represent rather decided departure from usual types of railway buildings.

Pennsylvania Installs Centralized Traffic Control on 30.3 Miles of Single Track 230

A description of facilities between Ben Davis, Ind., and Almeda, where a saving of twelve minutes on each freight train stop has been effected.

Air Conditioning on Passenger Equipment 233

R. W. Waterfill of the Carrier Engineering Company, Newark, N. J., outlines progress of current developments to secure greater comfort for passengers.

EDITORIALS

Concerning Consolidations 223
Confusing Taxes with Rental Charges 224
Motor Transport Section Merged 225
Prevent Claims Now 226
A Contrast 226
Railway Appliances Exhibit 226

GENERAL ARTICLES

Colonial Design Embodied in New Northern Pacific Station, by Lowry Smith 227
More Waterway Discussion—An Open Letter and A Reply 228
Pennsylvania Installs Centralized Traffic Control on 30.3 Miles of Single Track 230
I. C. C. Plans Inquiries Into Alleged Violations 232
Air Conditioning on Passenger Equipment, by R. W. Waterfill 233
Railway and Highway Competition 234
Freight Car Loading 235
More Draft Gear Developments 236
The Electric Locomotive Improves Its Capability, by H. L. Andrews 238
Rates on Alaska Railroad To Be Increased 242
Unit Cylinder Tender Truck Clasp Brake 243
Flexibility Provided in New Tie Plate Assembly 244
Express Agency Opposes Reduced Parcel Post Rates 245

MOTOR TRANSPORT SECTION

Operating Motor Coaches and Trucks Saves Money 246
Motor Transport Hearing at St. Paul 248
Containers Used in Co-ordinated Freight Service 249
Lapeer-Trailmobile Offer Semi-Trailer 250

COMMUNICATIONS AND BOOKS 252
LOOKING BACKWARD 253
ODDS AND ENDS 254
NEWS 255

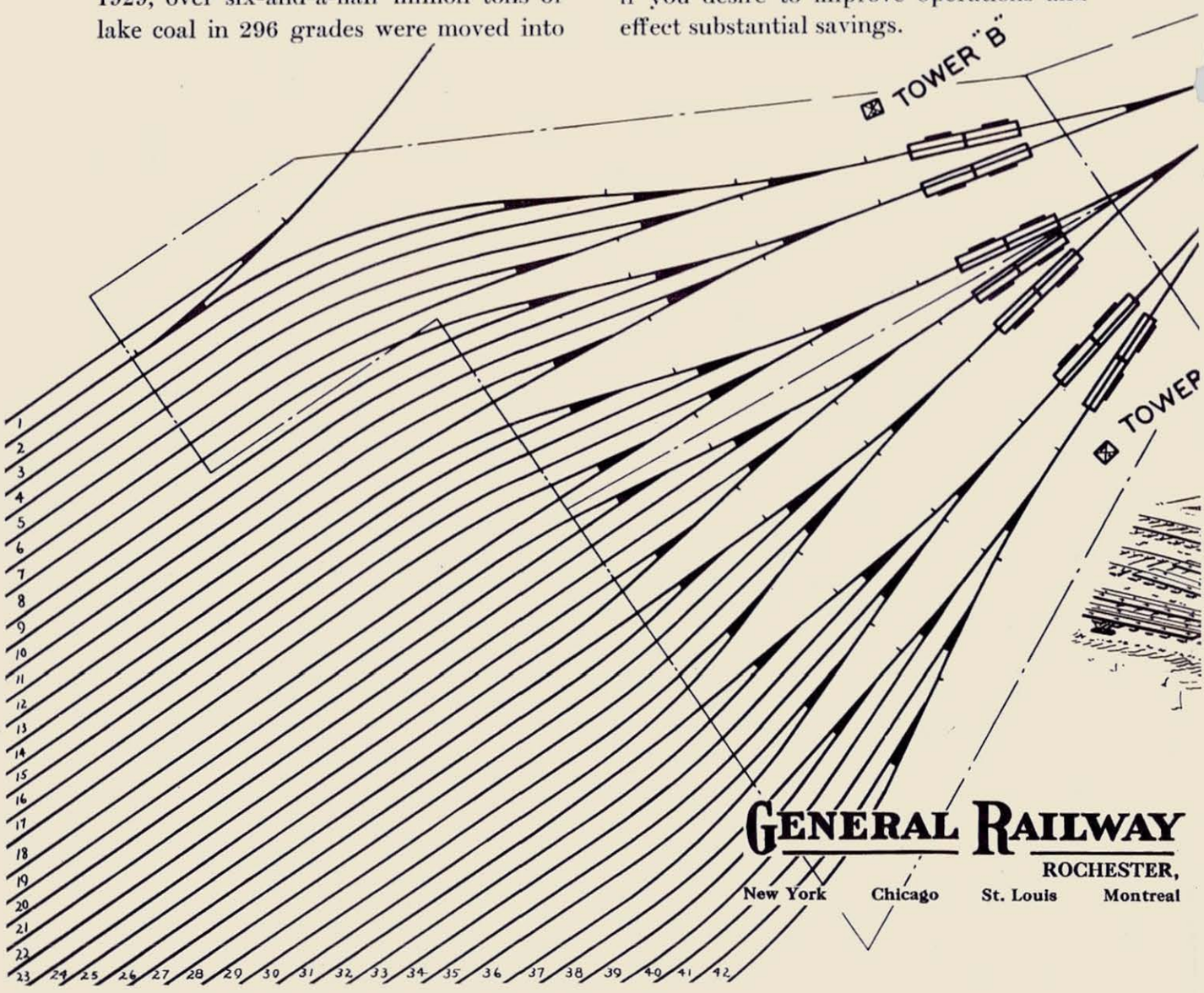
The Railway Age is indexed by the Industrial Arts Index and also by the Engineering Index Service

The Phantom

North Bound Stanley Yard near Toledo, Ohio, on the New York Central Railroad is now being equipped with G. R. S. All-Electric Car Retarders to facilitate and expedite the classification of coal shipments through the port of Toledo and other classifications to the several connections in the Toledo territory.

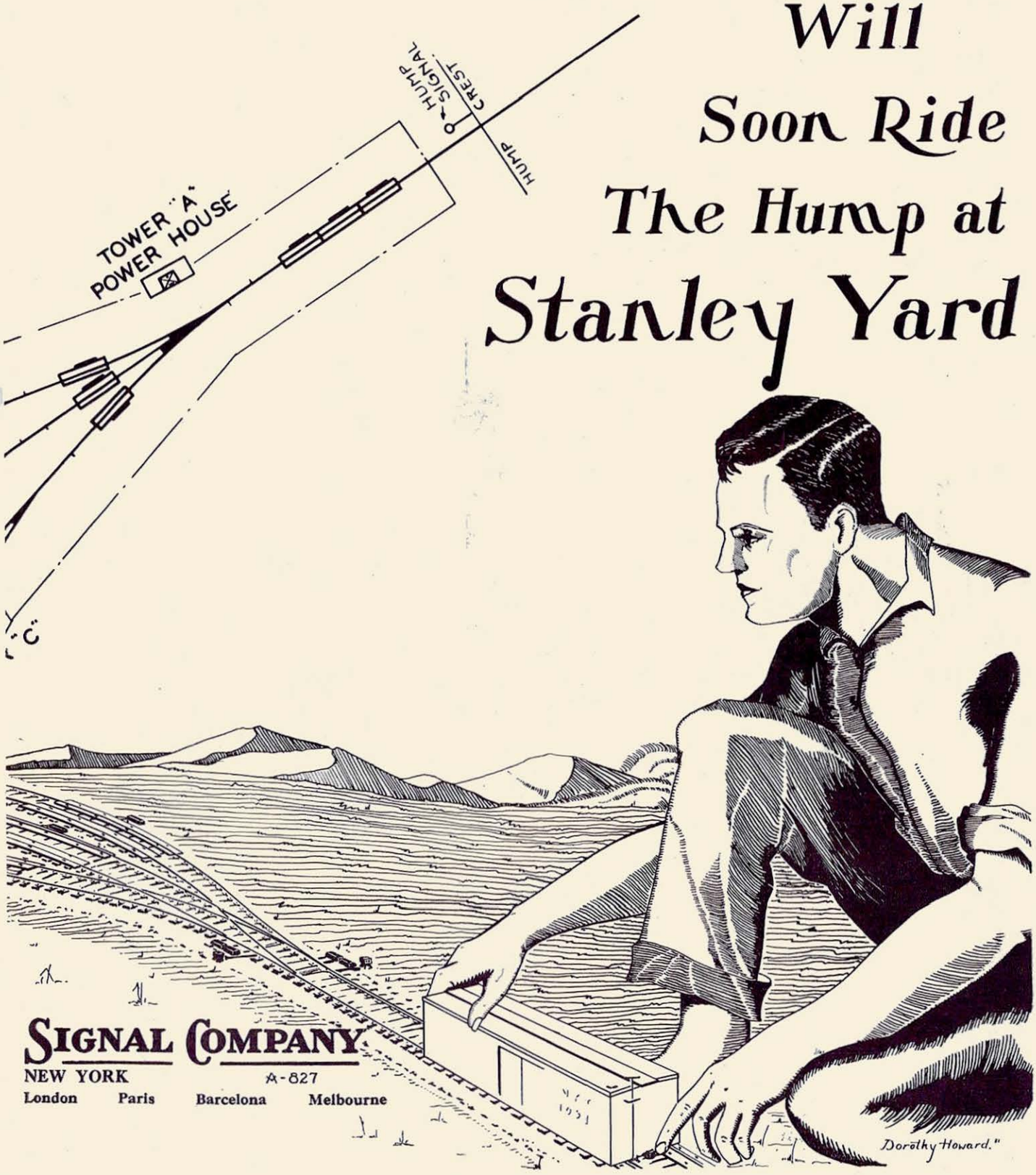
During the lake season, about 41% of the north bound tonnage is lake coal. In 1929, over six-and-a-half million tons of lake coal in 296 grades were moved into Stanley Yard, and after classification as to grade were dumped by the New York Central North and South Dumpers. Other business, in 1929, brought the total number of cars handled in Stanley Yard up to 780,000. In the future, practically all north bound business will be classified in the new G. R. S. Retarder equipped yard.

This is the 18th G. R. S. Installation. Consider this system in your 1931 Budget if you desire to improve operations and effect substantial savings.



GENERAL RAILWAY
ROCHESTER,
New York Chicago St. Louis Montreal

Car Rider Will Soon Ride The Hump at Stanley Yard



SIGNAL COMPANY

NEW YORK A-827

London Paris Barcelona Melbourne

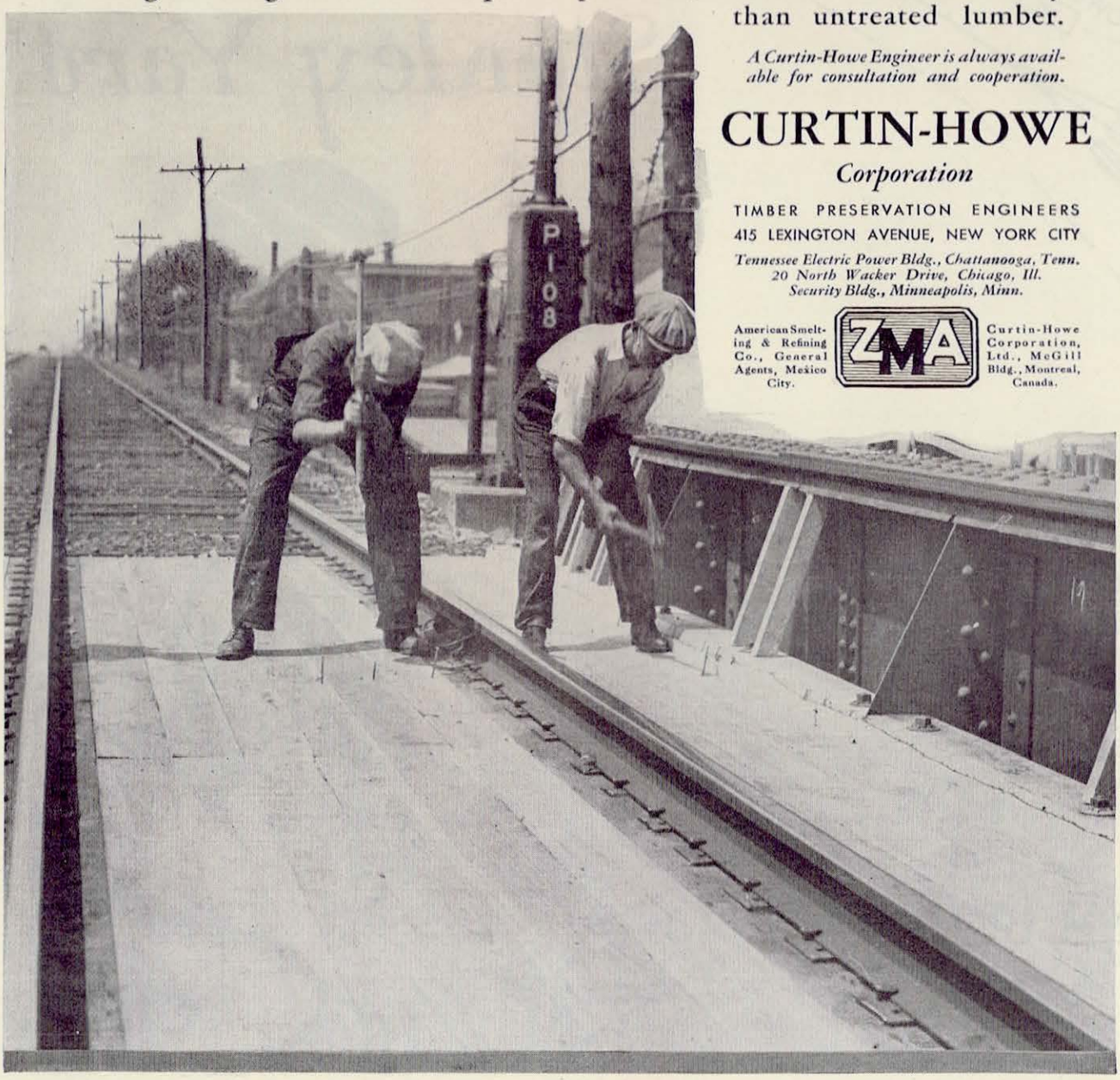
USE ZMA pressure-treated lumber where permanence is paramount

SINCE ZMA Pressure-Treated Lumber is permanently protected against decay and insects, it may be put to a great variety of uses, not only at terminals but also at relatively less important places along the right-of-way.

Permanence of protection is the outstanding advantage because ZMA pressure treatment will neither leech nor bleed under the severest conditions.

ZMA Pressure-Treated Lumber is especially desirable for general railway construction—platforms, gate houses, tool houses, snow fences, etc.—because it is clean, odorless, of natural color, paintable, and burns much less readily than untreated lumber.

A Curtin-Howe Engineer is always available for consultation and cooperation.



CURTIN-HOWE
Corporation

TIMBER PRESERVATION ENGINEERS
415 LEXINGTON AVENUE, NEW YORK CITY

Tennessee Electric Power Bldg., Chattanooga, Tenn.
20 North Wacker Drive, Chicago, Ill.
Security Bldg., Minneapolis, Minn.

American Smelting & Refining Co., General Agents, Mexico City.

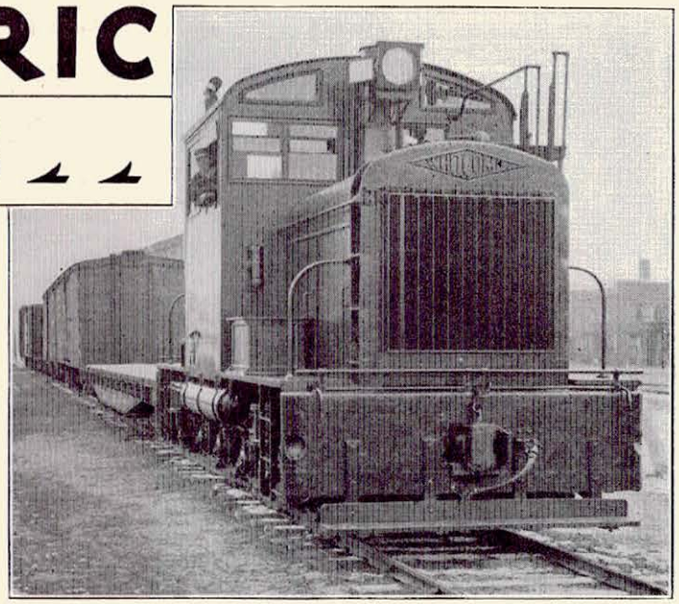
ZMA

Curtin-Howe Corporation, Ltd., McGill Bldg., Montreal, Canada.

WHITCOMB OIL-ELECTRIC SWITCHERS

PROVED BY "THE MILWAUKEE ROAD"

CHICAGO MILWAUKEE ST. PAUL AND PACIFIC



Quoting from page 1265, the Dec. 13th, 1930 issue of RAILWAY AGE: "Two 90-ton oil-electric switching locomotives built by Geo. D. Whitcomb Co., for the Chicago, Milwaukee, St. Paul & Pacific, have been in service for a number of months at the Kinzie street (Chicago) yards of that road, performing heavy industrial switching with economy and dispatch and demonstrating marked flexibility in meeting widely-divergent load and operating conditions.

" . . . dual Waukesha power plants of 300 hp. each were used, with controls so arranged that both power plants can function as a unit when handling peak loads, or independently . . . to meet the lighter load requirements.

" . . . Cab controls are located so that the operator can work from either side of the cab, transferring to either control station without loss of time. This arrangement permits of one-man operation, effecting a substantial reduction in crew expense.

" . . . On one day when the temperature range was between zero and 10 deg. F. above, 341 cars were handled by one locomotive in 6 hrs. 40 min. actual time.

"The industrial assignment of switching power at the Kinzie Street yard covers a period of 24 hr. daily, except Sunday and it has been found practicable to assign the oil-electric locomotive to 24-hr. service and work it through the entire six days without relief, using the time between Saturday afternoon and Monday morning for needed repairs.

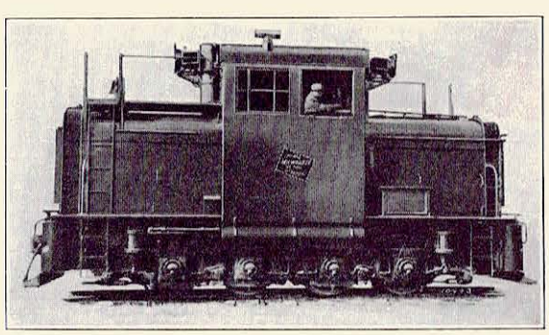
" . . . It therefore becomes practical for two oil-electric locomotives to perform exactly the same amount of work previously performed by three steam units. Further savings are effected by the reduced crew expense, lower costs of fuel, and reduced cost for repairs.

Refer to your December 13th copy of RAILWAY AGE . . . read the article just quoted . . . it tells a complete story of Whitcomb Locomotives for switching . . . gives data and related facts, shows various points of saving and notes an efficiency of performance in which you will be interested.

Write for literature on the Whitcomb Oil-Electric Switcher. Address Geo. D. Whitcomb Co., Rochelle, Illinois, U. S. A.

General Dimensions of Whitcomb Oil-Electric Switcher

Type	0-8-0
Weight on drivers	182,780 lb.
Size drivers	38 in.
Journal bearings, 6 in. by 11 in.	Timken
Wheel base rigid	13 ft. 6 in.
Wheel base total	13 ft. 6 in.
Length, center to center of coupling	29 ft. 6 in.
Length over cab	8 ft. 0 in.
Height over all	15 ft. 2 in.
Width over all	10 ft. 6 in.
Starting tractive force, maximum	45,500 lb.



WHITCOMB LOCOMOTIVES

. . . WHERE RED SIGNALS SAFETY

STANDING out against the gray horizon like air beacons, red-leaded structures signal safety to invested capital. These vast areas of red-leaded surfaces bear mute testimony to the foresight of engineers and maintenance men who recognize in red-lead a sure means of protecting iron and steel against time, weather...corrosion.

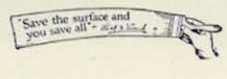
Dutch Boy Red-Lead is a fine, uniform, highly oxidized pigment. It makes a paint that works easily...that furnishes an elastic, durable coating which sticks tight—to protect better—to wear longer.

You can buy Dutch Boy Red-Lead in either paste or liquid form. The paste—Dutch Boy Red-Lead in oil—comes in natural orange-red and can be easily shaded to darker colors. Dutch Boy Liquid Red-Lead is supplied in six colors—orange-red, two shades each of green and brown, and black. Our Department of Technical Paint Service will be glad to help you solve your metal painting problems. Ask our nearest branch for booklet—"Structural Metal Painting."

NATIONAL LEAD COMPANY

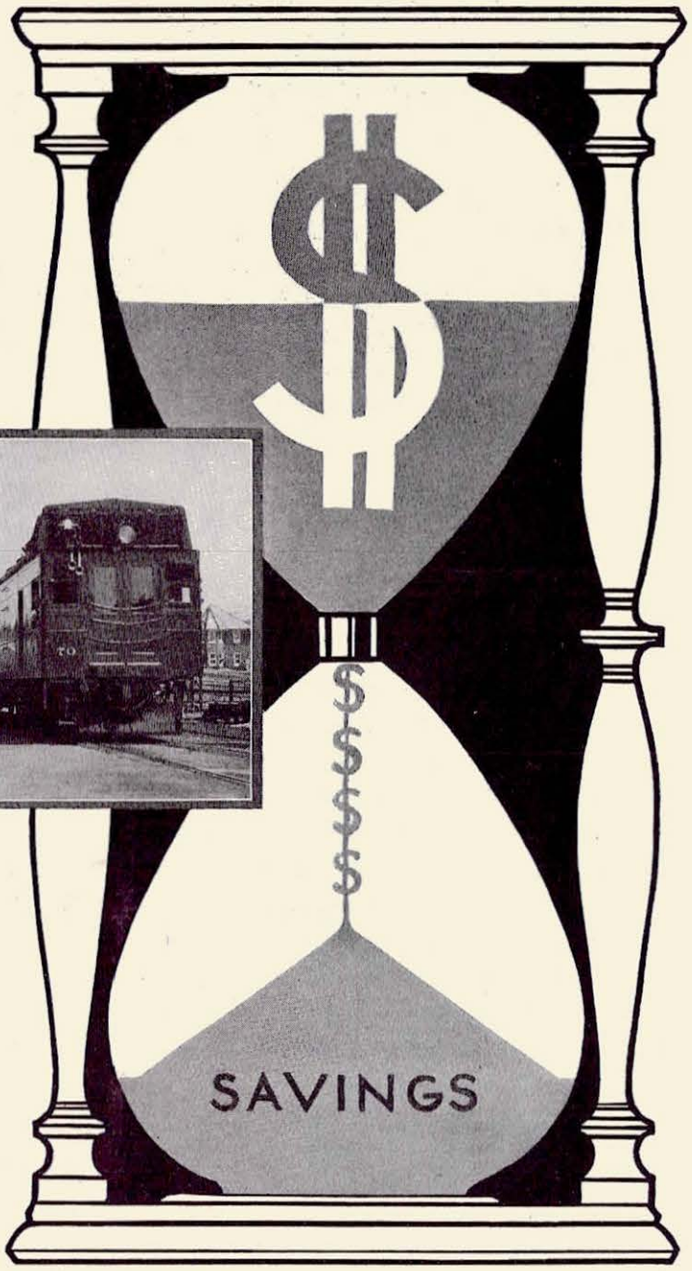
New York, 111 Broadway—Buffalo, 116 Oak Street—Chicago, 900 West 18th Street—Cincinnati, 659 Freeman Avenue—Cleveland, 820 West Superior Ave.—St. Louis, 722 Chestnut St.—San Francisco, 2240-24th St.—Boston, National-Boston Lead Co., 800 Albany Street—Pittsburgh, National Lead & Oil Co. of Pa., 316 Fourth Avenue—Philadelphia, John T. Lewis & Bros. Co., Widener Building.

DUTCH BOY RED-LEAD



SAVING HAULAGE DOLLARS

by saving fuel hours



WITH the Oil Electric unit, fuel costs are considerably lower than with steam operation.

With fuel oil at five cents per gallon, coal would have to cost less than sixty-seven cents per ton to compete.

While waiting for orders, the Oil Electric is shut down, eliminating fuel consumption.

Westinghouse Multiple-unit Oil Electric Train on the Reading Railroad.

◆ ◆ ◆

This advertisement is one of a series that shows how the following advantages of the Oil Electric Save Haulage Dollars:

by Saving Fuel Hours
by Saving Hostling Hours
by Saving Maintenance Hours
by Saving Crew Hours
by Saving Standby Hours
by Saving Performance Hours

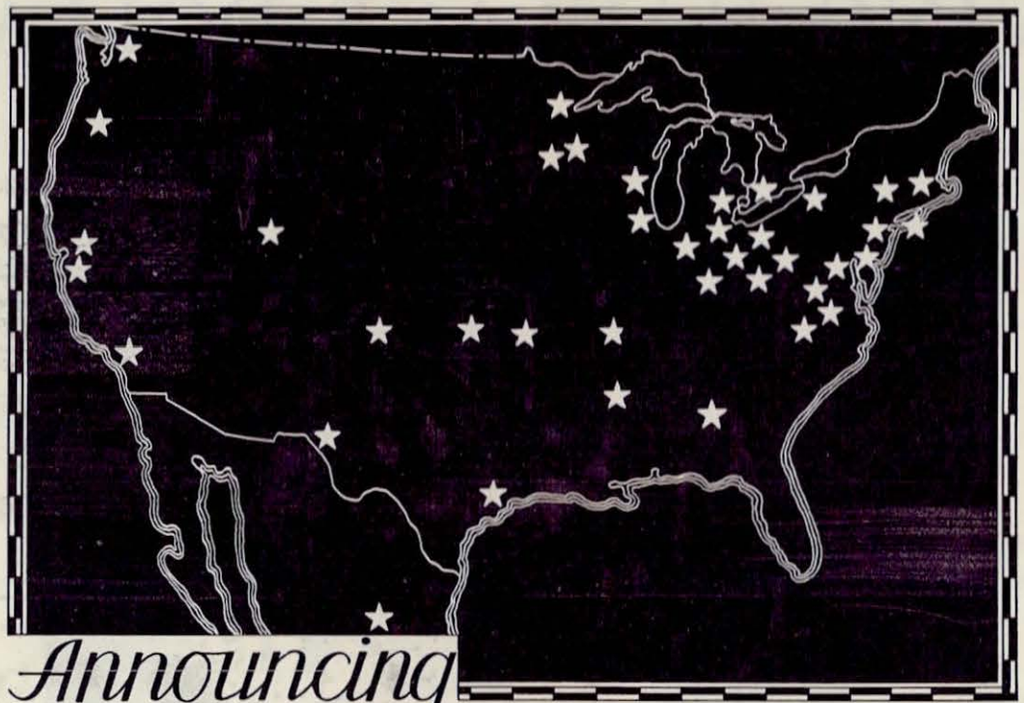
Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

WESTINGHOUSE ELECTRIC

T 31672

TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING.



Announcing

A NEW NATION-WIDE SERVICE PLAN

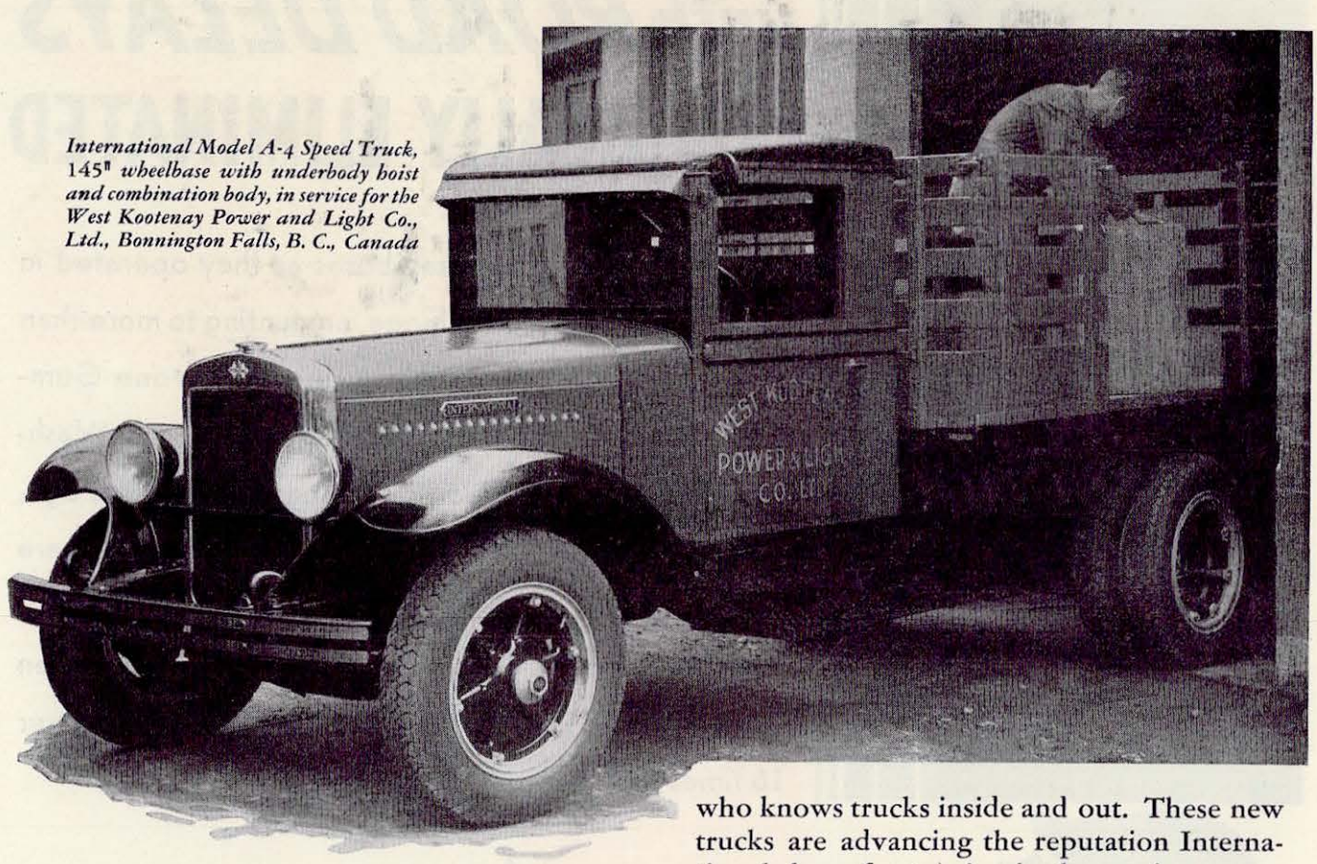
The name Bendix-Westinghouse, always synonymous with safety and dependability, has now come to mark a service . . . a unique service which promises to carry the effectiveness of the world's most dependable stopping force to even greater heights. Featuring factory reconditioning of automotive air brake devices, this new service plan is handled for the motor transport operator by a nation-wide network of Authorized Bendix-Westinghouse Distributors. Under this new system, compressors or governors, whose efficiency should become impaired through long or abnormal service, are submitted to the local distributor. He in turn diagnoses the trouble, issues a factory reconditioned unit bearing this identical warranty of new equipment and figures the repair costs on a new, low, flat rate basis. The obvious economy of this flat rate system and its elimination of service delays stamps it as a decided forward step in air brake maintenance. As sponsors of this new plan, we should be pleased to give you more detailed information regarding its many advantages. A booklet containing this information, together with a complete list of distributors, authorized to handle the work, will be mailed upon request to the BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Pennsylvania.

6285

BENDIX WESTINGHOUSE

AUTOMOTIVE AIR BRAKES

International Trucks Are Built to Do Your Kind of Work



International Model A-4 Speed Truck, 145" wheelbase with underbody hoist and combination body, in service for the West Kootenay Power and Light Co., Ltd., Bonnington Falls, B. C., Canada

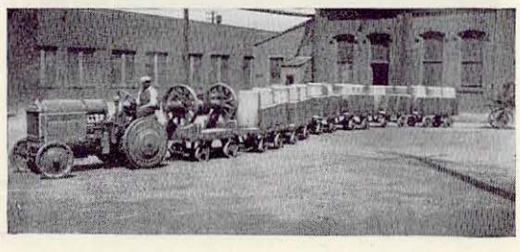
INTERNATIONAL TRUCKS have got what truck users want. This is proved by the wide popularity of Internationals. They can be depended on for low-cost work, day-in and day-out. They tackle the heaviest loads and the hardest going.

Today there is a complete new line of International Trucks. They are good looking, and their good looks go all the way through. Modern, rubber-mounted engines; cam-and-lever steering gears; self-energizing four-wheel brakes; vibration dampers; and multi-speed transmissions. These are some of the basic features which look good to the man who knows trucks inside and out. These new trucks are advancing the reputation Internationals have for turning in the maximum pay loads and pay mileage.

The best way to get acquainted with the new Internationals is to ask the nearest of 182 Company-owned branches in the United States and Canada for a demonstration. You will see International performance at first hand under all the conditions you want to put it through. You will see these new trucks in capacities and wheelbase lengths suitable for your work. You will get a new idea of motor truck values. Write us for information.

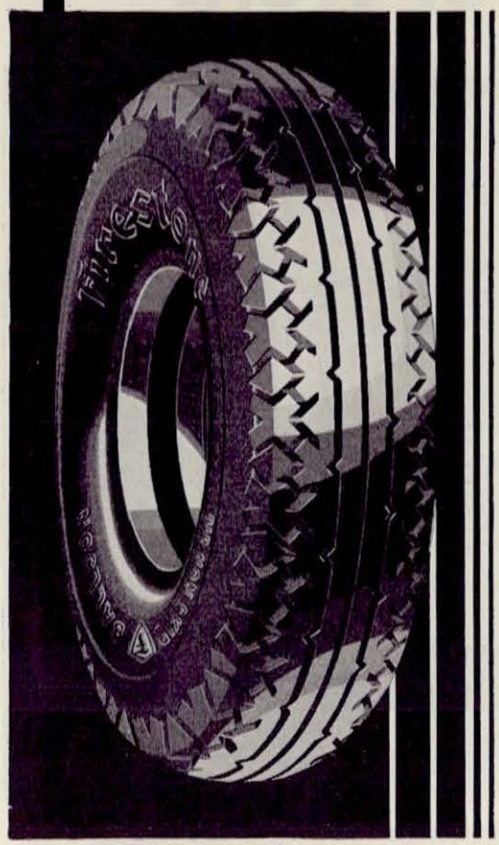
INTERNATIONAL HARVESTER COMPANY
606 So. Michigan Ave. **of America** (Incorporated) **Chicago, Illinois**

At right: A McCormick-Deering Industrial Tractor at work for the Nickel Plate Road. Many railroads have turned over a variety of jobs to the McCormick-Deering, thereby reducing their cost of handling materials and equipment. Two sizes: Models 20 and 30



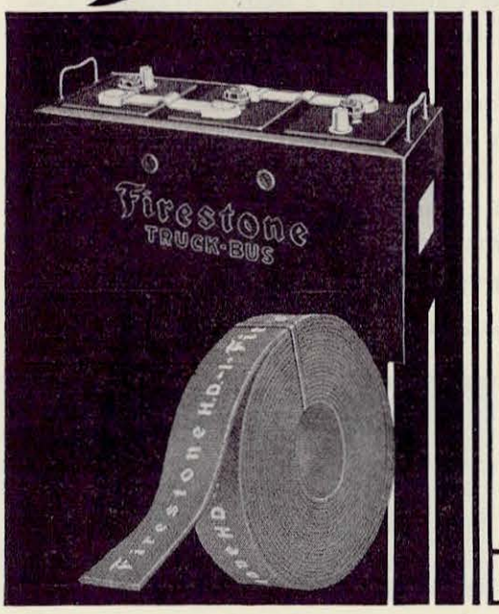
INTERNATIONAL TRUCKS

Three Times *the* Mileage *with* ROAD DELAYS PRACTICALLY ELIMINATED



THREE times as many buses as they operated in 1926! Three times the mileage, amounting to more than three million miles. And yet since Firestone Gum-Dipped Truck and Bus Tires were adopted by the Washington Railway and Electric Company, four years ago, road delays have decreased from 254 a year to a mere 27—*having been practically eliminated.* During this time the bus miles operated per tire failure have been *increased from 7300 to 120,542*—an increase of over 16 times the average of 1926.

Firestone



WHAT truly amazing evidence of the rapid strides that Firestone has been making in the improvement of Truck and Bus Tires! What eloquent testimony to the results which are being secured by Firestone's careful supervision of the use and care of its products—not for just a single year or two—but continuously over a long enough period of years to make a real test. And all this is but one of the many similar cases where owners of the country's largest fleets are depending on the Firestone Organization for more economical, less interrupted fleet operation. With Firestone Tires, Tubes, Batteries, Brake Lining and Rim equipment, you can profit by the broad experience of the Firestone Dealer, in the proper adaptation and care of your Truck or Bus equipment.

Specify Firestone Gum-Dipped Tires and Firestone Rims when purchasing new equipment.

TIRES - RIMS - BATTERIES - BRAKE LINING

POWER

FOR MORE WORK AND MORE PROFIT

THERE is one way—certain and sure—to prove how powerful Dodge Trucks actually are. Simply drive one—loaded to capacity—up the hill of your own choosing and over the road you usually shun. You will then know—without further proof—the advantages of such Dodge Truck features as sturdy engines with full force-feed lubrication, rugged, single-plate clutches, 4-speed transmissions, dependable full-floating rear axles and sturdy frames, springs, axles and drive shafts.

SOLD AND SERVICED BY DODGE BROTHERS DEALERS EVERYWHERE

DEPENDABLE

DODGE TRUCKS

THE COMPLETE LINE OF DODGE TRUCKS RANGES IN PAYLOAD CAPACITIES FROM 1,200 TO 11,175 POUNDS—PRICED, CHASSIS F. O. B. DETROIT, FROM $435 TO $2695, INCLUDING THE 1½-TON CHASSIS AT . . . $595

Three Helpful Books We Recommend

as *practical, authoritative* and *up-to-date*

Dyke's AUTOMOBILE and GASOLINE ENGINE ENCYCLOPEDIA 15th EDITION

Dyke's "Automobile and Gasoline Engine Encyclopedia" has been the standard work on autos for the past 18 years and is today. The author was the first automobile supply man in the business and he has become a national authority on the problems dealt with in this book,—hundreds of thousands of copies of which have been sold.

Ford Supplement Free

A big new supplement with 40 illustrations, on the new "A" model Ford, checked and "O.K'ed" by Ford engineers, is thrown in free with every copy of the 15th edition of Dyke's.

A Few Highlights on the 15th Edition

It contains 1271 pages packed with facts
There are 4300 practical illustrations and diagrams
The Index lists 15,000 subjects
Written in automobile shop language
Eighty-six Special Instructions, covering every angle of automobile construction and repair
Special instructions on testing and adjusting every part of the automobile
New 16-page section with four "Trouble Shooting Charts" in colors.

7 x 9¾ Inches, 1271 Pages, 4300 Illustrations and Diagrams, Cloth Binding, $6.00.

Dyke's Carburetor Book

A Companion Book to the Famous Dyke's Encyclopedia

By A. L. DYKE

This valuable book tells you what you want to know about Carburetors—Gasoline Fuel-Feed Systems—Air Cleaners—Superchargers—Ricardo Cylinder Heads and Engine Bearings.

Contains 106 pages 7 x 10 inches; 246 illustrations (many in two colors); and 20 instructions whose number sequence follows after that of the Encyclopedia so that it can be used in combination with that book.

Mr. A. L. Dyke, author of the "Carburetor Book," has been studying carburetors for twenty-nine years. As far as can be ascertained, he placed the first American-made constant-level type carburetor on the market in 1900.

7x10 Inches—246 Illustrations. 106 Pages, Cloth Binding, $2.00.

Electrical Trouble Shooting on the Motor Car and Airplane

By A. H. PACKER

Member of the Society of Automotive Engineers; Former Associate Editor of Motor Age

The thoroughly revised and enlarged edition of "ELECTRICAL TROUBLE SHOOTING ON THE MOTOR CAR" is now ready. This is the standard book for auto electricians, garage men, service station trouble shooters and automobile engine mechanics who seek knowledge of the electrical side of automobile work. It is written in plain shop language, is thoroughly illustrated with pictures and diagrams, and is supplemented with questions and answers to make it suitable for self instruction. A complete index enables quick reference being made to any phase of a particular subject. The method of presentation is practical. A simple principle is presented, its use is explained in some actual piece of equipment, followed by tests and kinks for locating trouble.

The book is filled with practical kinks and tests to use in the electrical shop. Automobile mechanics will find the first 41 chapters full of trouble shooting helps. The last six are particularly helpful in preparing for airplane service these men may be called upon to render in the near future. With the aid of this practical book auto mechanics and electricians can do their work more easily and profitably.

530 pages, 353 illustrations, 4 trouble shooting fold-in charts, 600 questions and answers, index, size 5½ by 8, flexible binding, $4.00.

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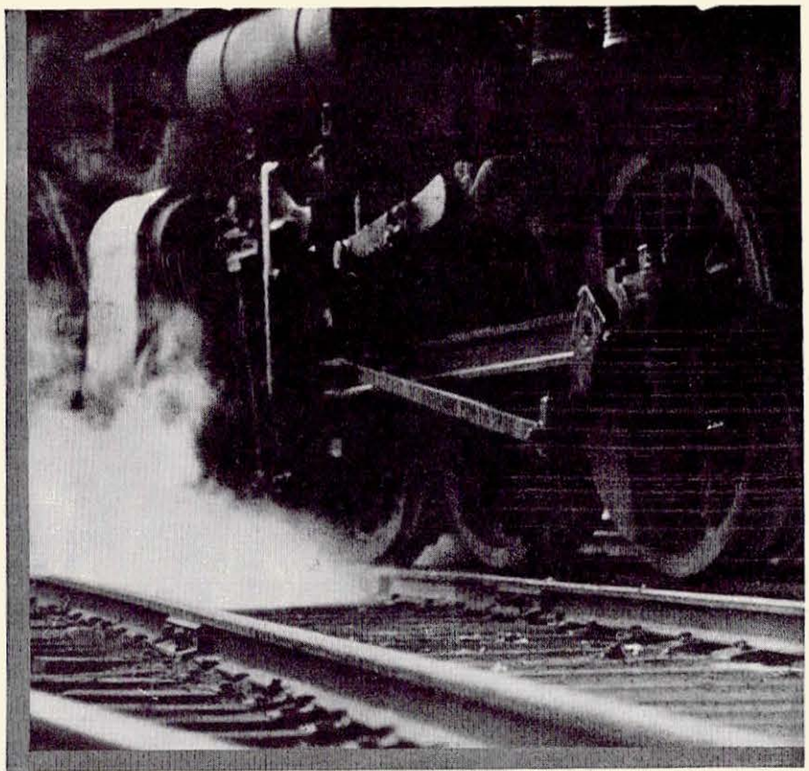
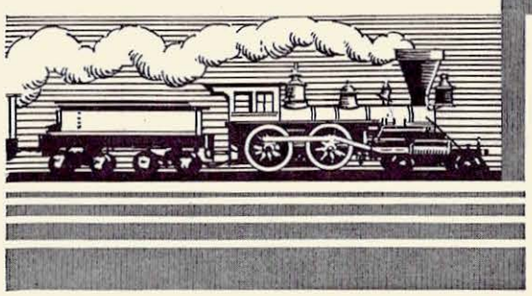


STEEL RAILS made modern locomotives possible . . .



Ethyl opened the way to BETTER *automobiles*

IN 1860, wiseacres said the peak had been reached in railroad transportation. Iron rails could not stand any more weight. Locomotives would never be any larger.

Then steel rails, made possible by Bessemer's converter, opened the way to further progress; opened the way to the giant locomotives of today.

* * *

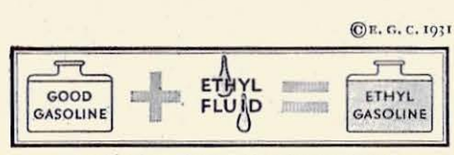
Automobiles faced a dead line a few years ago. Gasoline could not stand the high pressure demanded by more efficient motors.

Then Ethyl fluid was discovered. Added to good gasoline, it makes a motor fuel that stands high pressures without "knocking," or consequent power loss. The opportunity for progress that steel rails gave railroading, Ethyl Gasoline has given the oil and automotive industries.

High compression motors, powered by fuel that stands their pressures without detonating, point the way to further improvement in automotive efficiency. To the man who is directing the operation of bus lines higher compression motors offer:

Increased power without increased weight
Increased accelerating ability
Decreased heat waste.

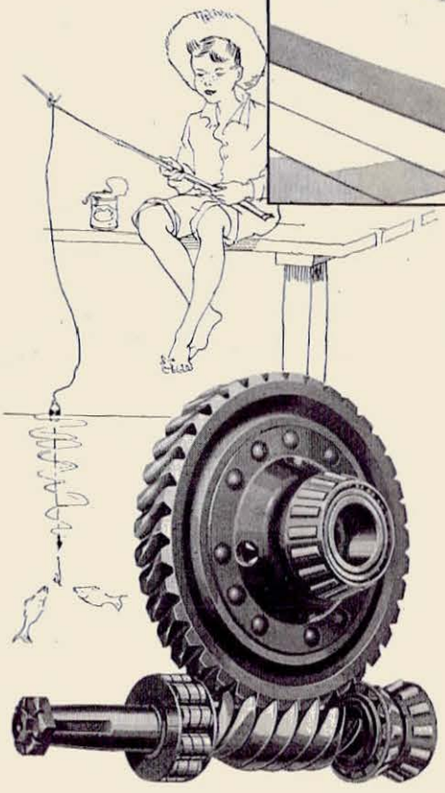
The fleet you operate today will prove more valuable with Ethyl Gasoline for fuel. Use this improved gasoline now; and as you add new busses, take advantage of the power of Ethyl Gasoline to gain the still further benefit of high compression motors. But remember Ethyl gives *any* motor greater power. Ethyl Gasoline Corporation, Chrysler Building, New York City.



The active ingredient used in Ethyl fluid is lead

ETHYL GASOLINE

Use worms for bait



Getting more passengers to ride your buses is much like fishing. Lots of people, lots of fish—what you get depends largely on what bait you have on your hook.

Use Worms for Bait.

Timken-Worm-Drive Axles are the kind of equipment that attracts and holds patronage.

Passengers like Timken equipped buses—they're quiet, and their low center of gravity makes them safe and easy to get into.

You like them, too—free from trouble and light on repair bills.

You profit both ways.

THE TIMKEN-DETROIT AXLE COMPANY, Detroit, Mich.

TIMKEN AXLES

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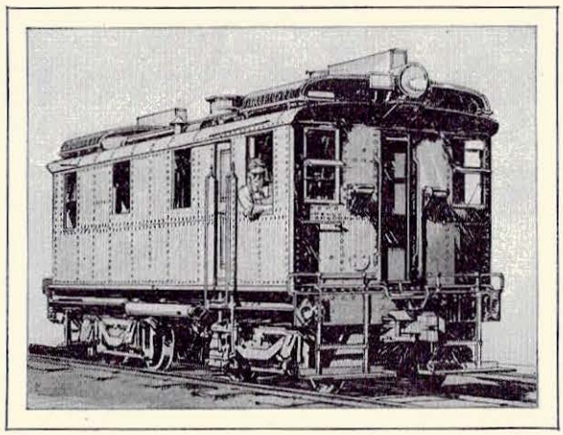
More than 90% of the Oil-electrics in Service are G-E Equipped!



The Facts Speak for Themselves

During the last six years, since the first G-E equipped oil-electric locomotive was placed in service, the railroads and industries of the country have purchased 105 oil-electrics. The General Electric Company has furnished the electric equipment for more than 90 per cent of these locomotives. In addition, the Company has built five 240-hp., 40-ton oil-electrics for the Chiriqui Land Company in Panama. ¶ That this confidence in General Electric was well founded is indicated by the fact that 60 per cent of these installations were made for companies already having G-E equipped locomotives in service. The following table shows the users of G-E equipped oil-electrics and the years that these installations were made.

Owners	Number of Locomotives	Horsepower	Year Placed in Service
Central Railroad of New Jersey	1	300	1925
Long Island Railroad	2	600	1925–1928
Baltimore and Ohio Railroad	1	300	1925
Lehigh Valley Railroad	1	300	1926
Lehigh Valley Railroad	1	300	1927
Chicago and Northwestern Railway	3	300	1926–1927
Chicago and Northwestern Railway	1	600	1930
Erie Railroad	2	300	1927–1928
Erie Railroad	2	600	1927
Erie Railroad	1	800	Building
Reading Company	2	300	1926–1928
Delaware, Lackawanna & Western Railroad	2	300	1926
Utah Copper Company	1	300	1926
Red River Lumber Company	1	600	1926
Ingersoll-Rand Company	1	300	1926
Great Northern Railroad	1	600	1926
Union Carbide Company	1	300	1927
American Rolling Mills	6	300	1927–1928
American Rolling Mills	1	600	1928
Donner Steel Company	4	300	1928–1929
New York Central Railroad	1	750	1928
New York Central Railroad	1	880	1928
New York Central Railroad*	38	300	1928–1930
Hoboken Terminal Railroad	1	300	1928
Hoboken Terminal Railroad	1	600	1928
Illinois Central Railroad	6	600	1929–1930
Foley Brothers	1	600	1929
Buffalo General Electric Company	1	300	1929
Ford Motor Company	1	300	1930
Ford Motor Company	1	600	1930
Michigan Central Railroad**	4	300	1930
Chicago, R. I. & Pacific Railroad**	1	300	1930
Delaware, Lackawanna & Western Railroad***	2	300	1930
Manufacturers' Railroad	1	1000	Under Construction

* Oil-electric-battery—600-volt, 3rd rail locomotive.
** Oil-electric-battery locomotive.
*** Oil-electric-battery—3000-volt trolley locomotives.

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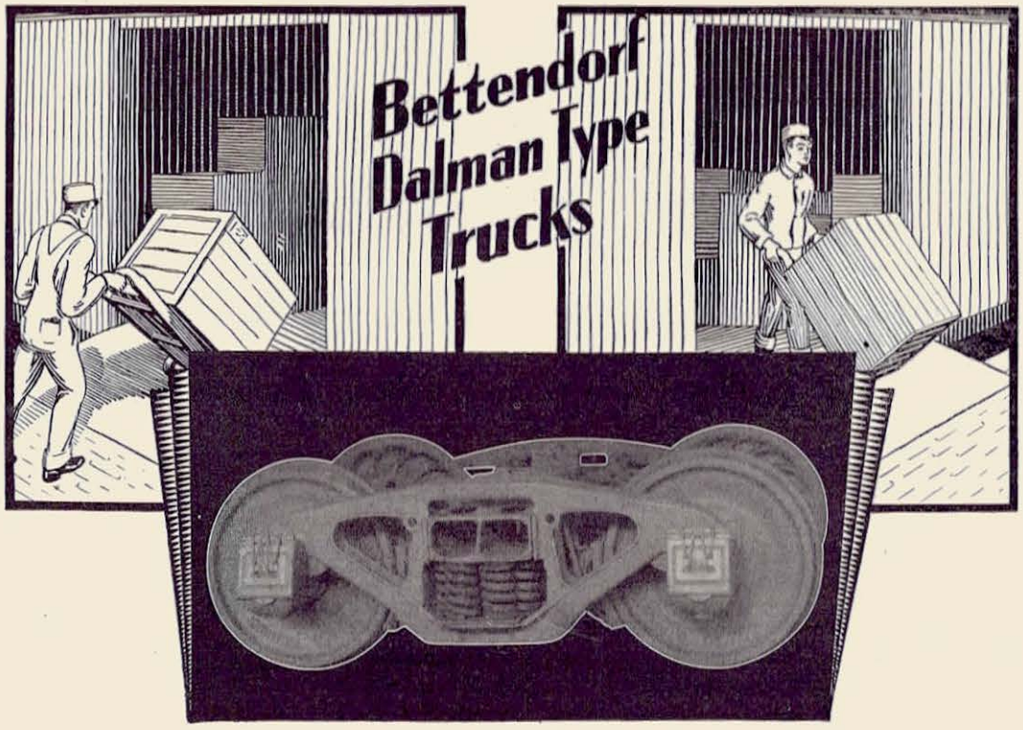
SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Maine To California . . .

Easy Riding Dalman Trucks Protect the Freight and Save the Car



The Dalman spring group which gives Bettendorf-Dalman Type Trucks ample reserve spring capacity and unusual shock absorbing ability, can now be furnished in a single cluster as illustrated above if desired.

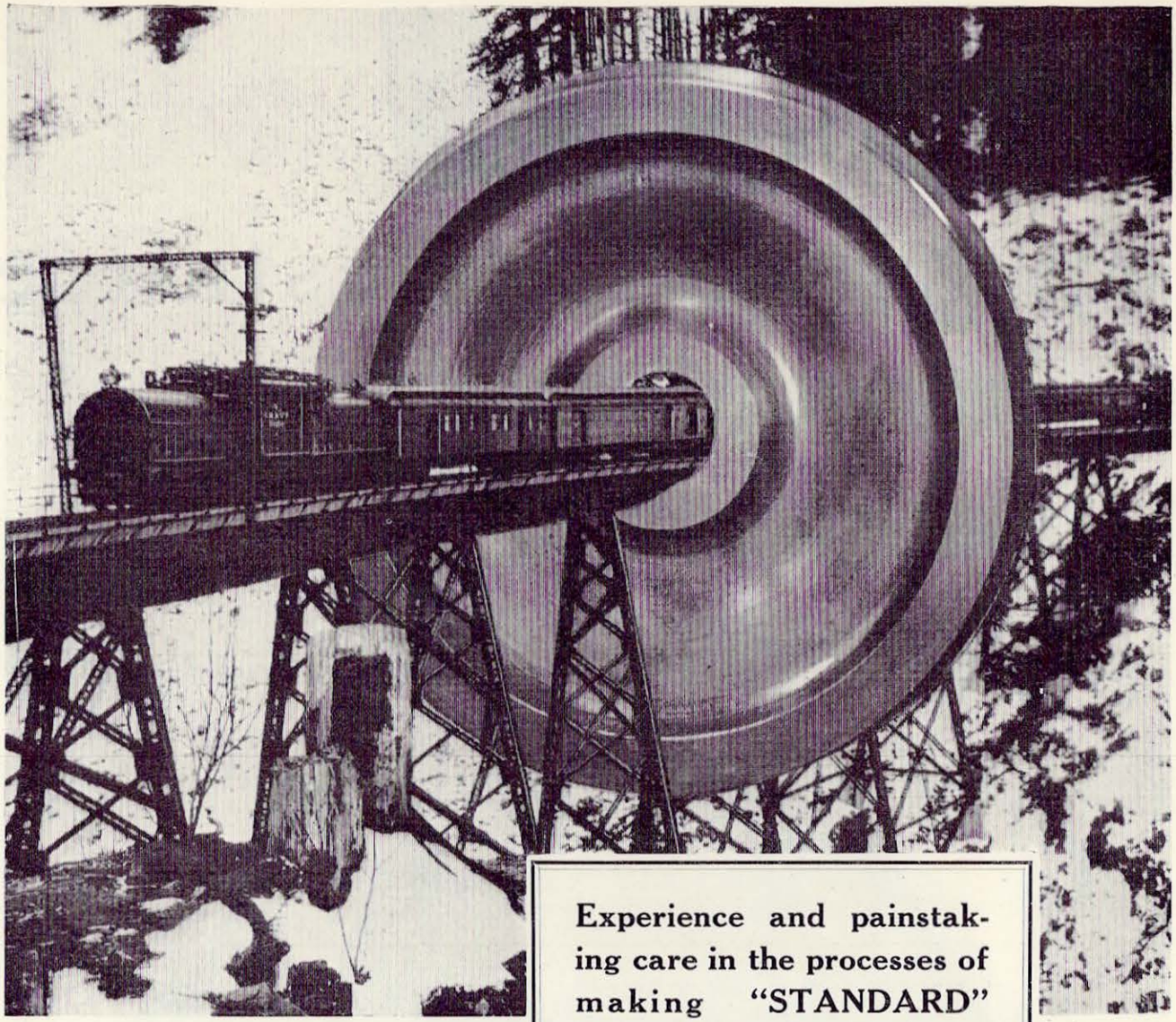
The Dalman Feature Adds Two Standard Coils To Each Spring Group.

SAFELY aboard in Maine and safely off in California. True of valuable and fragile freight as well as sturdy machinery. The Bettendorf Dalman-Type Truck has set at naught the countless potential road shocks that are the constant enemy of freight and car alike.

The road shocks are still there, but they cannot drive home with sickening and costly impact. They are smothered and disciplined within the ample Dalman spring group with its ability to withstand even the more severe of the thumps ever present along the steel highways of trade. Is it any wonder that the more exacting specifications read "Trucks—Bettendorf Dalman Type".

THE BETTENDORF COMPANY

OFFICES AND WORKS BETTENDORF, IOWA



Experience and painstaking care in the processes of making "STANDARD" Wrought Steel Wheels are responsible for the many miles of service they deliver and their high degree of safety.

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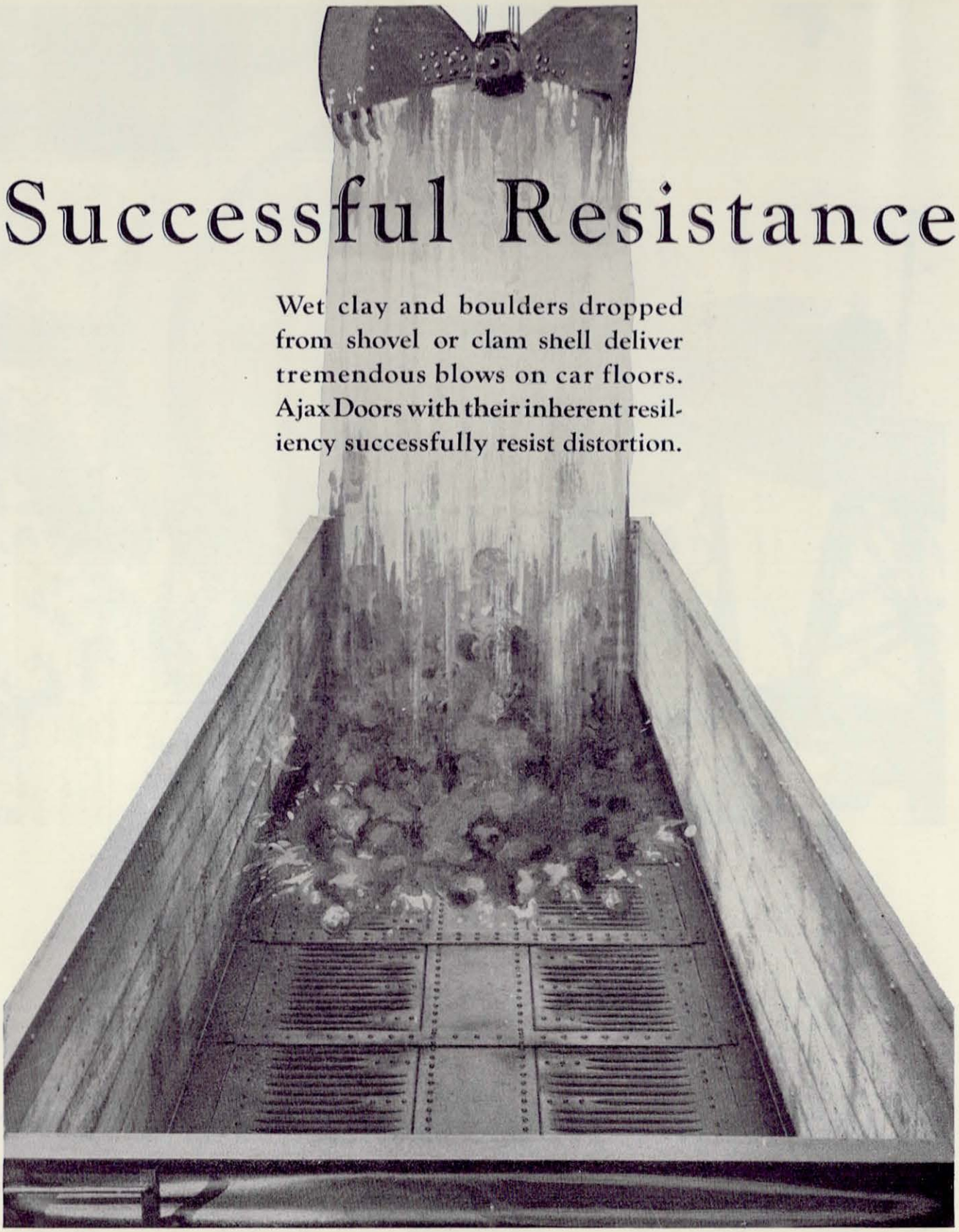
Wet clay and boulders dropped from shovel or clam shell deliver tremendous blows on car floors. Ajax Doors with their inherent resiliency successfully resist distortion.



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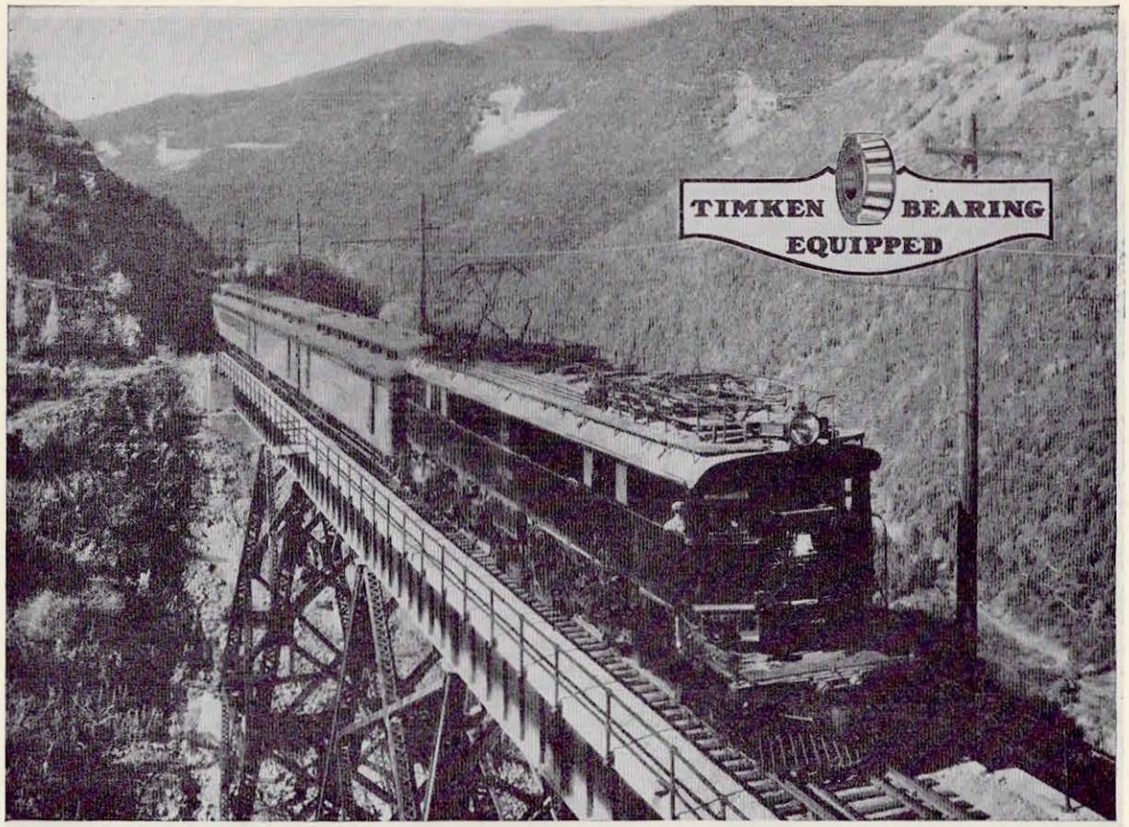


Timken Bearing Equipped Cars Go More Than 200,000 Miles per Year In "Olympian" Trains

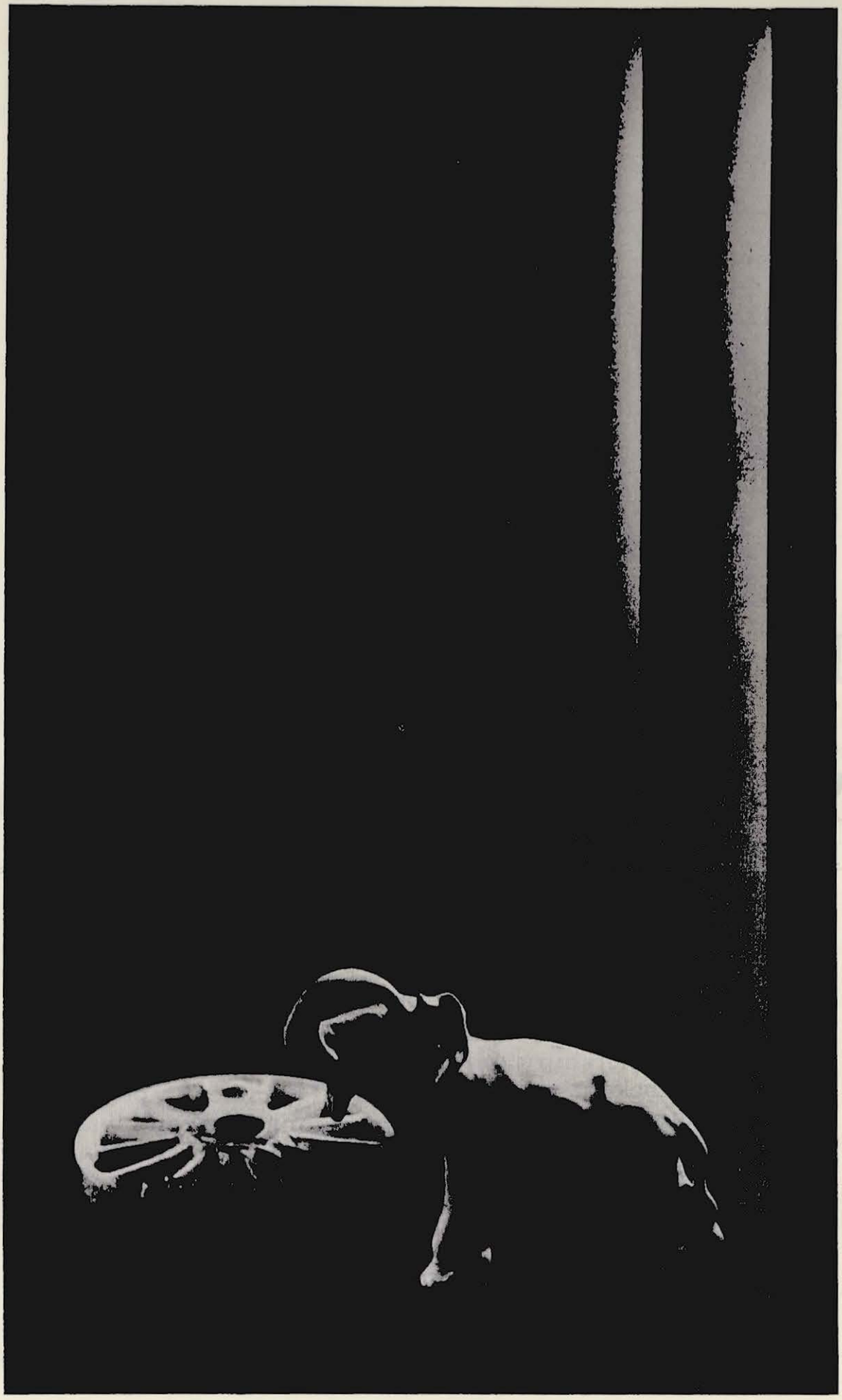
Eight Timken-equipped trains are used by the Milwaukee Road in their famous "Olympian" transcontinental limited service, and six trains are on the road at all times.

The Pullman cars and cars of Milwaukee ownership used in these trains make a round trip between Chicago and Seattle-Tacoma every eight days, which works out at an average of over 200,000 miles per year.

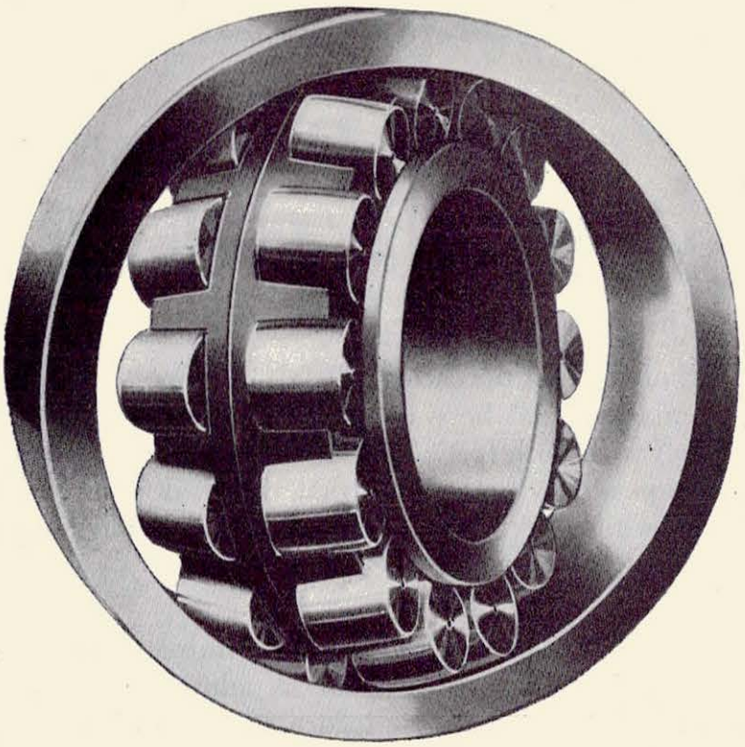
But in defiance of speed, load and grade, Timken Bearings carry on with confidence, eliminating hot boxes, preventing delays, going for months without attention for lubrication or maintenance, reducing starting resistance 88%, increasing speed and bringing greater riding comfort to passengers.

It takes the exclusive combination of Timken tapered construction, Timken positively aligned rolls and Timken-made steel to give modern anti-friction benefits in full, including radial-thrust load capacity. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**



one . . . should . . . compare . . . the . . . driving . . . wheel . . . center . . . of . . . Birdsboro . . . Thirty . . . with . . . the . . . mammoth . . . for . . . its . . . strength . . . toughness . . . and . . . resistance . . . to . . . fatigue



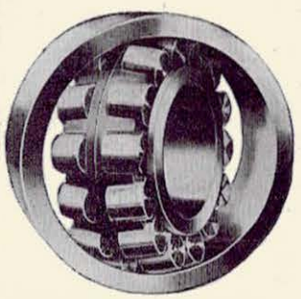
HOW BIG Should A Bearing Be?

BEARING performance follows certain definite laws. No hocus pocus can endow an under-sized bearing with wondrous qualities that will enable it to do a job that requires a bigger bearing.

When the conditions responsible for the bearing loads are known, the size of the bearing can easily be decided upon.

With railroad equipment, the loads can be determined and these loads govern bearing size. Using a bearing of inadequate capacity is to invite trouble.

SKF has never compromised on bearing capacity. As a result SKF Journal Bearings have built up enviable records for dependable performance. In designing new equipment provide plenty of room for an anti-friction journal bearing of proper size.



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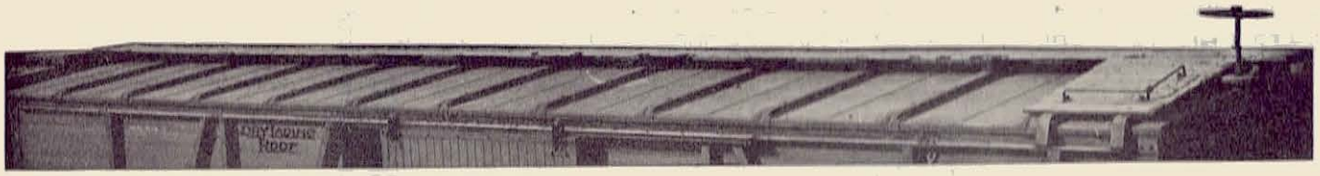


What Some of the Railroad Operating Officials Tell Us.

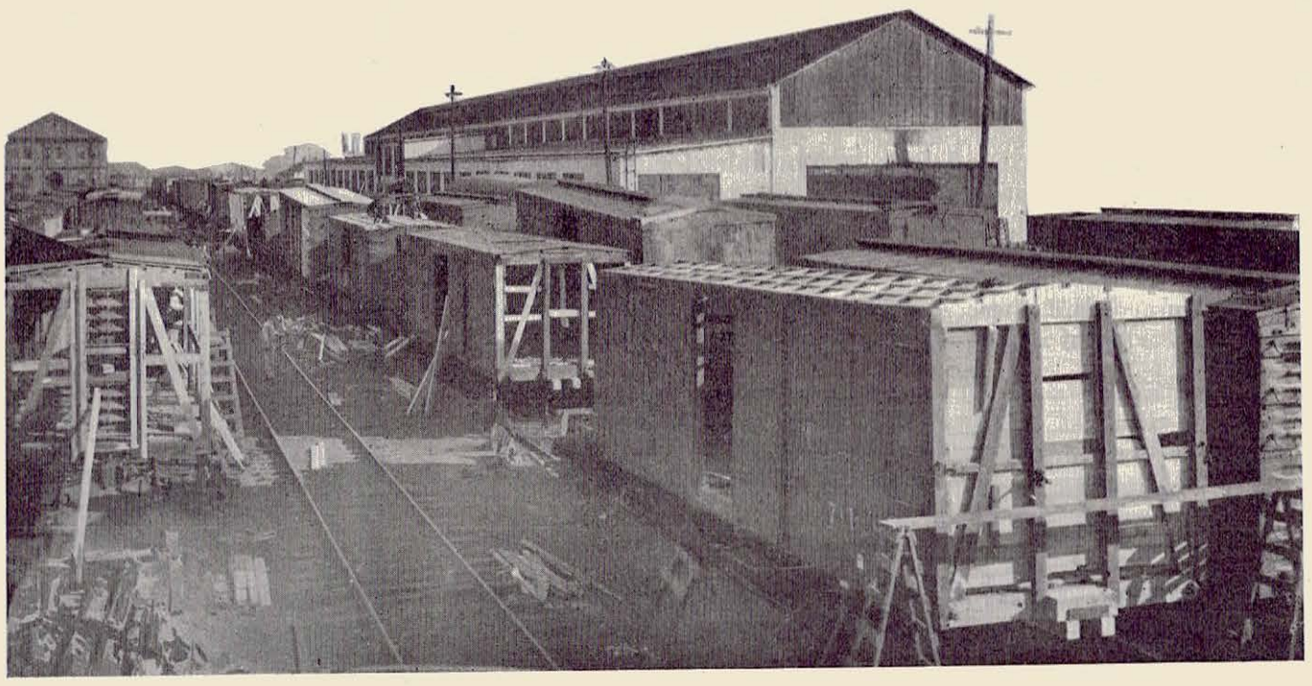
The Universal Dry Lading roof is the only roof that has one size and one design parts that are capable of fitting any design or size of house car on Standard gauge track.

ONE of the best operating officials of a Western railroad remarked that he was for the Universal Dry Lading roof with both feet. "Why you cannot go into any of our car shops along the line but that you find from one to a dozen cars which have been standing 30 to 60 days waiting for roof repairs."

The Universal Dry Lading roof would eliminate such a condition and this alone is worthy of its adoption by all railroads. When the official was informed that quick roof repairs is only one of a thousand different reasons why the Universal Dry Lading roof is the outstanding improvement in car construction history, he answered,

"That one reason is enough for me."

HUTCHINS CAR ROOFING COMPANY
DETROIT MICHIGAN
Established 1880



RAILWAY AGE

Concerning Consolidations

The program of general railroad consolidations adopted by Congress by the passage of the Transportation act of 1920 was not initiated by the railroads. They had always opposed the government policy of trying, under the Sherman anti-trust law, to prevent the railways from adopting any means to reduce competition, but the policy of consolidating all railways into a comparatively small number of large systems originated with public men, and especially with Senator Cummins of Iowa. This policy having been adopted by the government, the railways often have been criticized for not making sufficient efforts speedily to carry it out. The advocates of large consolidations have claimed that the inactivity of the railways was preventing the nation from getting the benefits it would derive from fully carrying out the policy of the Transportation act.

These criticisms were unjust because the law required that consolidations should be made in accordance with a plan to be promulgated by the Interstate Commerce Commission, and until about a year ago it had issued no plan. When the commission did issue a plan, it provided for five systems in eastern territory. The fifth system would not have been comparable in strength with the other four. The chief executives of the principal four existing systems have now worked out and submitted to the commission a plan in accordance with which practically all lines in eastern territory, exclusive of New England, would be consolidated with the Pennsylvania, the New York Central, the Baltimore & Ohio, and the Van Sweringen lines. This presents to the public with an entirely new definiteness an opportunity to indicate whether it really wants all the railways of the country consolidated into a comparatively small number of large systems.

Consolidations and Organized Labor

There are still wide differences of opinion among those, including railway executives, who have studied the question, as to whether the consolidation of all the railways into a limited number of large systems actually is desirable from the standpoint of either the railways or the public. By the existing provisions of the Transportation act, however, Congress has declared that this policy is desirable. Therefore, the commission, being merely an agent of Congress, must assume the desirability of consolidations in general, and, reasoning from that premise, can hardly reject as undesirable the proposed four system plan in eastern territory. That plan is the result of months of study and conferences by some of the ablest railway executives in the country. Without seriously reducing competition, it would make it more equal. The economies that can be obtained by consolidations undoubtedly have been greatly exaggerated; but doubtless as large economies could be secured under this plan as under any other that could be proposed. If it is to be approved by the commission it should be approved as promptly as possible, because all the lines involved will postpone needed expenditures for improvements until the uncertainties as to their future are removed.

The most effective opposition to consolidations is being offered by railway labor leaders because of their apprehension as to its effects upon employment. As the payroll is much the largest part of operating expenses, the bulk of any economies effected must be accomplished by reductions of the amount of labor employed. That labor is entitled to consideration in the carrying out of a program which has been initiated principally as a matter of public policy there can be no question. As a matter of fact, however, a considerable number of the employees of each railway pass out of its service each year owing to deaths, retirement on account of age, discharge for cause, or voluntary resignation. A considerable reduction in the number of employees can, therefore, year by year be effected merely by not replacing those who, in any event, would leave the service. It does seem as if some arrangement might be made between railway executives and labor leaders as a result of which the opposition of the latter to consolidations would be withdrawn.

A Danger in Consolidations

Whatever may be their merits in other respects, consolidations are, for one reason, a menace to the railways. They have been advocated as means of largely solving the railroad problem upon the assumption that

they would strengthen the credit of the railways and reduce their operating expenses. It is significant that Senator Couzens of Michigan repeatedly has raised a question as to how soon consolidations could be followed by reductions of rates.

If consolidations are to be widely accepted by public men and the public as a sovereign means of solving the railroad problem, then it would be better for the railways that none of them should be effected. The credit of each of our railways, however small or large, always has been and always will be determined by the amount of net operating income it earns. Only if consolidations result in large economies will they have any substantial effect upon net operating income, and it is not probable that they will result in economies anywhere near as large as the ardent advocates of consolidations have anticipated.

The railways need more liberal regulation of rates and freedom from unregulated, subsidized competition far more than they need large consolidations, and it would be very unfortunate if they should get consolidations as a substitute for these other things.

Confusing Taxes With Rental Charges

On the Communications page of this issue appears a letter to the editor from H. E. Barber, a former railroad man, now a bus operator, which we commend to the attention of all who are interested in the subject of governmental levies on commercial motor vehicles. Mr. Barber disagrees with us in our contention that such charges need strengthening. Indeed, he goes so far as to say that bus and truck taxation is already too high. This last assertion, it seems to us, plainly cannot stand without much supporting data which our correspondent does not vouchsafe. Motor bus and truck taxation is a hodge-podge, with varying bases in the different states and with total charges per vehicle in some states a mere fraction of those in others. And in hardly any instance has any attempt been made to set a value on a state highway system, assigning scientifically the proportion of construction and maintenance costs made necessary by heavy commercial vehicles to these vehicles, levying rentals on them accordingly.

Mr. Barber mentions the instance of a railroad which entered testimony in the Interstate Commerce Commission's hearings on motor transport, showing that it paid 6.85 per cent of its gross revenues for taxes, whereas its highway subsidiary paid 13.01 per cent of its gross. It must be remembered, however, that the railway, having paid 6.85 per cent of its gross in taxes, had (probably) about 14 per cent more to pay out for maintenance of way, plus a return on the investment in way—a total of probably not much less than 25 per cent of its revenues going for expenses represented by the bus line's so-called "tax" bill (which also includes the right to use public property for business purposes) of 13.01 per cent.

When defenders of the exploitation of public highways for private gain compare the percentage of gross revenues which they pay in taxes with those paid by the railways, they are comparing dissimilar things. Railroad taxes are their contribution toward the expense of police protection, public improvements, etc. The highway companies get all of this for their contribution to the public purse *plus* a right to exploit public property for profit. "Taxation", therefore, is a misnomer for the levies on commercial highway users. That percentage of their gross revenues which equals the percentage of railway gross revenues paid as taxes may justly be called taxation. The remainder, where there is a remainder, may be said to represent a rental payment for the use of the highways. "Bus Facts" for 1930 states that bus lines in 1928 paid 7.23 per cent of their gross revenues in "taxes." In the same year the railways paid 6.37 per cent of their revenues in taxes. Assuming the latter to be a fair exaction from a transportation enterprise for the police protection, etc., afforded by the government, then bus operators paid only 0.86 per cent of their gross revenues as rental for the costly highways they use as a place of business (a facility which, privately provided, costs the railways not far from 20 per cent of their gross revenues, over and above their taxes).

Mr. Barber's statement that buses and trucks are already paying more than their share of highway costs, with the inference that some of their charges might properly be shifted to private automobile owners, is extremely interesting, and we wonder whether his view is shared by other highway operators. If so, we think that in fairness to the private automobile owners announcement should be made that bus and trucks are now paying 33.2 per cent more in taxes than their fair share (Mr. Barber's figure), and that private motorists' taxes should be raised and those on trucks and buses lowered accordingly.

Such an opinion, it seems, must arise from a confusion in terms. Public parks are built, maintained and policed at the expense of the taxpayers and are open to the general public on a basis of equality, but this does not mean that anyone is entitled to start hawking toy balloons and peanuts in these parks without paying for the privilege. If an individual desires to establish a business in these parks—a refreshment stand, for instance—he does not consider the payment he makes for this privilege as a tax, but as a rental. Still less does he add his rental payment to his legitimate tax bill, as the bus operators do, and refer to the total as taxation, and then complain how much higher his tax bill is than that of the non-commercial users of the park.

The *Railway Age* believes that the question of the *taxation* of buses and trucks, i.e., their payment toward

the general expenses of government, is relatively simple of solution. In the interest of fairness, the rate of such taxation should bear approximately the same ratio to gross revenues as that paid by the railways and this rate should be raised or lowered for both commercial motor vehicles and railways as the expense of government makes necessary. There still remains, however, the question of an adequate rental payment for the use of the highways, which should begin where the assessment for general governmental purposes leaves off. The excess, if any, of such payments over and above fair taxation for general purposes is the real measure of the commercial highway users' contribution toward the use of public property for private profit. Such payments at the very minimum should equal that proportion of highway construction and maintenance costs attributable to heavy vehicles. Logically they could be much more, since commercial value, frequently determined by competitive bidding, and not minimum cost usually determines the rental to be exacted for the use of other public facilities for purposes of private gain.

We have confined our comment on Mr. Barber's letter to his view on taxation, since that is the main point of our disagreement with him. With some of his other contentions we find ourselves in entire harmony. His letter is a stimulating contribution to the discussion of this important problem, and, on the whole, calculated to be helpful rather than otherwise. His failure, incidentally, to appreciate more fully the underlying principles of the railways' position on the subject of payments for commercial use of the highways is not to be greatly wondered at, in view of the lack of elaboration of this position in the testimony the railways have thus far presented in the Interstate Commerce Commission hearings.

Motor Transport Section Merged

Effective with this issue, the *Railway Age* is consolidating Section One and Section Two of the fourth issue each month. Since September, 1926, Section Two has been issued as a separately bound Motor Transport Section. In future, the *Railway Age* will give editorial attention to the co-ordination of railway and highway service, not once a month, but every week. The fourth issue in each month will contain a department under a special heading devoted to railway motor transport; but, in addition, the subject will be treated in the other issues as well.

This change in editorial method is not to be construed as an indication of a change in editorial policy regarding motor transport. Properly co-ordinated motor transport has become as much a part of railroading as the construction and maintenance of track, the operation and maintenance of locomotives and cars, and the other longer established functions of railroad departments. Just as operating, engineering, and mechanical matters have been treated in the *Railway Age* week after week, so will railway motor transport matters be treated in the future.

The *Railway Age* is more strongly convinced than ever before of the inevitability, and the desirability from all standpoints, of the co-ordination of railway transportation and motor transportation. Recognizing the fundamental necessity of railway transportation, it also recognizes the utility of motor coaches and motor trucks in certain fields of service. It reaffirms its conviction that there can be little competition between railway transportation and motor transportation when each confines its activities to those spheres of operation to which it is best suited. The competition which exists today, an uneconomic, wasteful competition, will not continue when full co-ordination of the two kinds of service is attained. This competition will be eliminated by the withdrawal of certain kinds of railway service, on the one hand, and by the withdrawal of certain kinds of motor vehicle service, on the other hand.

The primary function of motor transport should be to extend and increase the efficiency of the railway service available in this country, rather than to endanger it through wasteful duplication of service and through destructive competition which has no economic justification for its existence. That such destructive competition now exists, we believe to be due to the fact that there is inadequate regulation of motor coaches and motor trucks by governmental authorities, and to use of the highways in a manner which is radically contrary to the public interest.

The *Railway Age* is convinced of the desirability, in the public interest, of such taxation of motor coaches and motor trucks, regardless of their ownership or the purpose of their use, as will fully compensate the public for their use of the public highways. It favors comprehensive regulation of motor coach and motor truck transportation in order that there may be equality of opportunity between motor transportation and railway transportation. Only when motor coach and motor truck taxes are adequate, and only when motor coaches and motor trucks are properly regulated, will it be possible to determine definitely the proper respective places of railway transportation and motor transportation in the general passenger and freight carrying system of the country.

The *Railway Age* will continue to devote attention to motor transportation because of its conviction of the importance of motor transport to the railways. There will always be a place for the motor coach and the motor truck in short-haul transportation, and in extending railway service in such directions as in the store-door collection and delivery of freight.

Prevent Claims Now

With traffic at its present relatively low ebb, there are at least two good reasons why operating officers should devote some attention to the work of freight claim prevention. The first is that the railways' income is sufficiently low without paying any of it out for loss and damage claims. The second is that, with reduced forces, only experienced men are now employed, men of responsibility, and length of service who are more amenable to freight claim education than temporary employees.

When an enormous amount of business is being handled, speed is likely to outweigh considerations of carefulness to a certain extent. Now, when there is a temporary lull in the violent rush, is the time to inculcate careful handling methods, so that they may become habitual and continue after business returns to normal. This also applies to rough-handling of trains and cars. There is little enough justification for such things at any time, and even less under present conditions. Education carried on now will produce excellent results later.

In other words, the depression should be regarded by operating officers as affording an opportunity for education in proper methods, and for checking up and eliminating operating inefficiencies that may have developed and continued unnoticed during the period when heavy traffic made supervision more difficult than it is now.

A Contrast

The year 1930 established a new high record in the number of deaths resulting from automobile accidents, according to figures just released by the National Safety Council. In that year 32,500 persons lost their lives from this cause, or four per cent more than in 1929. This increase occurred in a year in which the increase in motor vehicle registration was less than one per cent. It is interesting to note in this connection that as recently as 1906 here were only 416 automobile fatalities.

In marked contrast with this increase in automobile fatalities, the number of deaths at railway grade crossings *decreased* from 1,711 to 1,448, or 15 per cent during the first nine months of 1930. This latter figure is particularly significant. It indicates that the combined efforts of railway and public authorities, especially the former, to educate the automobile-using public to the necessity of exercising proper precautions when approaching a grade crossing are bearing fruit. It shows also that a reduction in the accidents at such points is possible without the elimination of the crossings themselves if proper efforts are made.

Of more importance, however, is that these figures show that the problem of safety of highway travel is far broader than that of accident control at grade crossings, and that public authorities must look elsewhere for the solution of this problem.

Railway Appliances Exhibit

The March exhibit will be held as usual. In reaching this decision, the directors of the National Railway Appliances Association expressed their conviction that the present calls for the orderly continuation of those measures that promote business stability and that to suspend activities, long established and of proven value, tends to unsettlement that, under present conditions, leads to results that are more than usually disturbing. The decision to proceed with undiminished energy in the presentation of the exhibit on March 9-12 is more than a gesture towards the promotion of good business. As such it deserves the support and cooperation of railway officers, particularly those of the associations which meet in Chicago at that time.

The March exhibit is an institution of some 23 years' standing. In this period of nearly a quarter of a century, it has been held without an interruption, even during the strenuous period of the war when so many railway associations suspended activities. It brings together annually the world's greatest display of the materials and equipment used in the construction and maintenance of roadway and signaling facilities. Of special value is the opportunity afforded for the presentation of new devices not heretofore known. Its educational value is attested by the many who visit it, exceeding many times over those who attend the conventions themselves.

The exhibit should be of special value this year when the pressure on railway men to reduce costs is so great and when every mechanical aid to this end is so eagerly sought. In this connection it is to be expected that the number of devices and materials exhibited for the first time will be greater than normal, for it is in such periods as the one through which we are now passing that railway supply companies have the opportunity to perfect equipment and materials which may of necessity, have lain dormant during periods of more active business.

The National Railway Appliances Association confines its attention solely to its exhibit, which is entirely separated from the convention and located at a distance from the convention hotels. It collects no funds for other than the exhibit itself. This fact should not be lost sight of at a time when convention entertainment is undergoing such thorough scrutiny.

All in all, the March exhibit is a business-like presentation of equipment and materials adapted to the solution of railway problems. As such it should be of special interest to railway men this year.

The Entrance Porticos Are an Attractive Feature of the Station

Colonial Design Embodied in New Northern Pacific Station

Passenger facilities at Mandan, N. D., represent rather decided departure from usual types of railway buildings

By Lowry Smith

Office Engineer, Northern Pacific, St. Paul, Minn.

THE Northern Pacific, during the past season, made a rather decided departure from the type of architecture generally found in railway buildings by employing a Colonial design in the construction of a passenger station and a restaurant building at Mandan, N. D. Mandan is an important division point, located on the west bank of the Missouri river opposite Bismarck, the state capital. The city is the gateway to the old West and is named for the Mandan Indians, who formerly lived in five great villages in the immediate vicinity. The topography of the west shore of the Missouri river changes abruptly from rolling prairies to broken buttes, characteristic of the bad-land cattle country farther west.

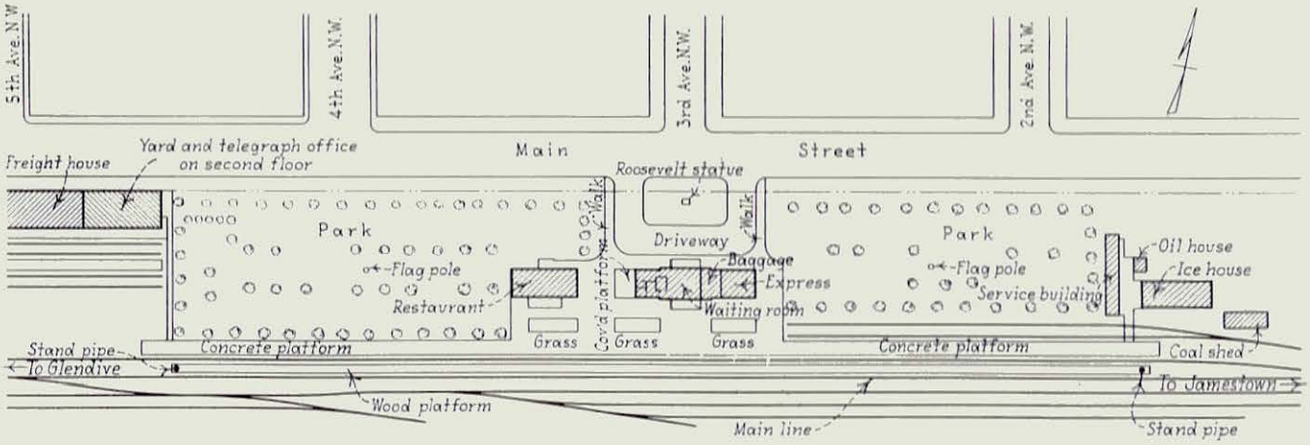
The station grounds at this point are quite large and are surrounded by many fine trees which were planted shortly after the railway was constructed. This setting, together with the traditions which are associated with the vicinity, prompted a desire to deviate from the conventional type of architecture generally employed in the design of railway station buildings. The Colonial design was adopted as suitable for this location.

The buildings are one story high and of red brick construction with gray asbestos slate shingles, laid in the American fashion. The passenger station is centered on one of the main cross-town streets, which are at right angles to the main line of the N. P., and is about 100 ft. back from the curb of Main street, which parallels the main line. The restaurant building is located just west of the station building and is adjacent to the station park.

The Colonial design of the station structures is brought out strikingly by the columned porticos that have been provided at each main entrance. This effect is enhanced by the open balustrade that surmounts each portico and in the station building by the arched transoms of the two main entrances and of the flanking windows. An added feature of the station building is a cupola in which the Colonial design is manifested by the encircling balustrade, and the arched effect of the windows. The broad fireplace chimney at one end of the lunch room also assists materially in bringing out the Colonial effect.

The street side of the station building is approached by a broad curved drive surrounding a grass plot in which a statue of Theodore Roosevelt has been placed. A broad sweep of concrete platform on the track side of the structure is set off attractively by a number of rectangular grass plots.

There are two passenger tracks at this point, one of which is served by a concrete platform, 15 ft. wide and 1,100 ft. long, and the other by a temporary plank platform somewhat shorter, which lies between the two tracks. It is planned ultimately to convert the former into an island platform by constructing a track between it and the buildings.

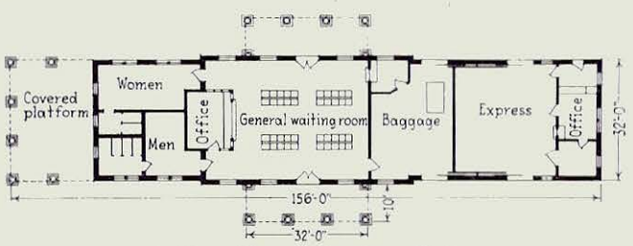


A Plan of the Station Grounds at Mandan

The station building is 34 ft. wide and 156 ft. long, including a 22-ft. covered platform at the west end. The facilities include a general waiting room, 32 ft. by 43 ft.; a women's rest room, 13 ft. by 26 ft.; a smoking room, 11 ft. by 17 ft.; a baggage room, 22 ft. by 32 ft.; an express room, 32 ft. by 30 ft.; toilets, etc. There is no necessity for a basement under the station as steam for heat is furnished from the nearby engine terminal power plant. All piping is in concrete tunnels.

The floors of the waiting rooms and toilets are covered with a terrazzo white and brown mixture, the wainscot consists of Norman Flash tile, and the walls and ceilings are plastered and painted a flat tan and white, respectively. Oak is used for all the interior finish woodwork.

In the restaurant building, the floors are of a terrazzo green and white mixture, while the wainscot in the lunch



A Floor Plan of the New Station

room and the base course in the dining room are of green Kraft tile. The walls and ceilings are plastered and painted a light shade of flat green and white, respectively. The interior woodwork in this building is also of oak.

The restaurant, which is operated by the dining car department of the N. P., is fitted throughout with the most modern equipment. The kitchen, as well as the other rooms, is kept free of smoke and cooking fumes by means of a forced-draft ventilating system and, as in the case of the station, steam for heating as well as for cooking is supplied from the power plant. Other equipment includes a refrigerating machine for storage and service boxes and for manufacturing ice, and a water-softening plant, which not only supplies water for local needs but also to trains for drinking and toilet use.

The improvements at Mandan also include the construction of a 1,000-ton refrigerator-type ice house for passenger-train service, which is located a short distance east of the station buildings. In addition, the unfinished second floor of the existing freight house was completed to provide offices for the yardmaster, the trainmaster and the telegraph department, which were formerly located in the old station building. The freight house is located west of the station grounds and was constructed several years ago with such an object in mind.

These improvements were designed and the construction work was supervised by the engineering department of the Northern Pacific, under the general supervision of Bernard Blum, chief engineer. The arranging and equipping of the restaurant building was done in co-operation with the dining car department.

More Waterway Discussion—An Open Letter and A Reply

THE National Rivers and Harbors Congress has devoted its Bulletin Number One, 1931, to an open letter from S. A. Thompson, secretary of that organization, to Samuel O. Dunn, editor of *Railway Age*, which Mr. Thompson has asked shall be published in this paper. The letter is self-explanatory and is followed in the bulletin by an editorial which appeared in *Railway Age* of December 27, 1930, pages 1351 and 1352, entitled "Waterway Advocates Denounce Waterway Discussion," and the "Statement of Purposes" of the Rivers and Harbors Congress, which was adopted on December 10, 1930.

Mr. Thompson's open letter, dated at Washington on January 8, which is published in accordance with his request, is as follows:

For 25 years the National Rivers and Harbors Congress has been actively advocating the improvement and use of waterways, not to supplant but "to augment and supplement transportation by rail." During that time its annual conventions have been addressed by presidents and vice-presidents of the United States, members of the cabinet, senators and representatives in Congress, diplomats from all the leading countries of the world, governors of states, railway officials, merchants, manufacturers and business men in many lines coming from every part of the country. Out of all these hundreds of speakers, you are the first and only one who has seen fit to supplement his platform utterances with a printed statement which maligns, misrepresents and insults the organization whose invitation had been "greatly appreciated" and which had given him a courteous hearing.

On the morning of December 10, 1930, in Washington, D. C., you addressed the twenty-sixth convention of the National Rivers and Harbors Congress, presenting "The Transportation Situation" from the railway viewpoint. It is not my intention here to discuss your paper, with its many fallacies, except to say that, while you are an able advocate, you could never qualify as a judge. In the afternoon of that same day the con-

vention unanimously adopted a set of resolutions, or, as we call it, a Statement of Purposes.

In the issue of the *Railway Age* for December 27, 1930, you published an editorial headed "Waterway Advocates Denounce Waterway Discussion," and, in order that we may have all the facts before us, the resolutions adopted by the Convention and the editorial which appeared in the *Railway Age* are reproduced in full herewith.

The National Rivers and Harbors Congress, as portrayed in your editorial, reminds one of the "huge, shapeless, half-blind, horrid monster" mentioned in Vergil's Aeneid. According to your description, we are "fanatics who disregard economic considerations;" "benighted advocates who desire to restore transportation to what it was in the Middle Ages;" we declare that, in spite of the guarantees in the Federal Constitution, "free speech regarding the waterway question is prohibited;" we would like to silence all spokesmen for the railways, either by reviving the Inquisition and burning them at the stake or by standing them before a firing squad, *à la Stalin,* the Soviet dictator; we are traitors to democratic ideals, who are trying to "Russianize the United States;" and so on, *ad libitum,* almost *ad infinitum,* and completely *ad nauseam.*

Into the word "tolerate," as used in our resolutions, you read a strained and distorted meaning for which there is no possible justification. Webster's International Dictionary, which is accepted as an authority by the Supreme Court of the United States, defines it as follows: "Tolerate. To suffer to be, or to be done, without prohibition or hindrance; to allow or permit negatively, by not preventing; to put up with; as to tolerate doubtful practices."

It is evident that you formed a very low opinion of our delegates as you looked them over from the platform. I can assure you, however, that they are quite as familiar as you can be with the guarantee of free speech contained in the Constitution, and that the idea of prohibiting fair play for the railroads, either "in public discussions" or "in the adoption of public policies" never entered their heads. Your editorial, therefore, constitutes "an insolent insult to the intelligence and fairness" of the ladies and gentlemen who adopted these resolutions, after giving to your address an attentive and respectful hearing and a generous round of applause at its close.

How utterly grotesque is your charge that we wish to prohibit full and free discussion of waterway questions is shown by the number of railway men who have addressed our conventions. Among those that I recall are "Jim" Hill, of the Great Northern; Finley, of the Southern; Delano, of the Wabash; Sims, of the Delaware & Hudson; Markham, of the Illinois Central; Walker Hines, Director General of Railways; and Samuel O. Dunn, of the *Railway Age,* who has spoken to us twice—supplemented on the second occasion by an editorial.

While we would not "prohibit free discussion" if we could, and could not do it if we would, we certainly intend, in the future as in the past, to use every legitimate means to "hinder," and "prevent" the success of, all "efforts from whatever source to defeat or delay that program" of waterway development which has been "approved by the American people and adopted by their representatives in Congress."

About the most ridiculous statement in your editorial is the following: "In what way have the railways heretofore opposed waterway development? Solely by discussion." (!?!) The Inland Waterway Commission, of which the late Senator Theodore E. Burton was chairman, had an entirely different idea of it. In the "Findings" of its preliminary report (page 19) the commission said: "While the decline of navigation in the inland waterways was largely due to the natural growth and legitimate competition attending railway extension, it is also clear that railway interests have been successfully directed against the normal maintenance and development of water traffic by control of water-fronts and terminals, by acquisition or control of competing canals and vessels, by discriminating tariffs, by rebates * * * So large a portion of railway traffic is free from water competition that railways can readily afford to so reduce rates on those portions affected by such competition as to destroy the profits of the water lines without appreciably affecting the profits of the rail systems which recoup these reductions by higher rates elsewhere."

Fifty years ago—and "heretofore" covers all the time there ever has been up to the present—the railways were free to use, and did use, any method whatever that was found necessary to destroy water competition One by one, however, the claws of the railway tiger have been clipped and appropriations for rivers and harbors have been greatly increased. You may be interested to know that during the 25 years the National Rivers and Harbors Congress has been at work, appropriations for waterways, have been greater by more than $771,000,000 than they were during the preceding 104 years.

The Transportation Act of 1920 contains the following words—which were inserted therein by the president of the National Rivers and Harbors Congress, Senator Ransdell, at the suggestion of the undersigned, who is its secretary: "It is hereby declared to be the policy of Congress to promote, encourage, and develop water transportation, service and facilities in connection with the commerce of the United States, and to foster and preserve in full vigor both rail and water transportation."

How have we secured these results? (And by "we" I mean not only the members of the National Rivers and Harbors Congress, but all the friends of waterways). "Solely by discussion!" That was the only weapon we had to use. It has served our purpose well, however, and we propose to keep right on using it until we get everything we want. We are entirely confident that, when the great connected system of waterways and harbors for which we are working has been completed, it will be of immeasurable benefit not only to the Nation but to every interest therein—including the railroads.

Mr. Dunn replied to this letter on January 16, as follows:

The logic of the open letter that you addressed to me on January 8 is as poor as most arguments that are used to bolster up the cause of inland waterways.

On December 10, in response to an invitation extended by you, I delivered an address before the National Rivers and Harbors Congress in Washington. You asserted in your open letter to me that I "supplemented" my "platform utterances with a printed statement which maligns, misrepresents and insults the organization whose invitation" to address it I accepted. The implication of your statement is that I was guilty of gross discourtesy to the members of the National Rivers and Harbors Congress.

I have been a newspaper man for many years. I have been editor of the *Railway Age* for 20 years. I am willing to have the facts as to what actually occurred submitted to the editor of any newspaper or magazine in the United States, and let him decide whether I was discourteous to the members of the National Rivers and Harbors Congress. You have tried to show that I was discourteous by tying together in your open letter two incidents that were in no way connected.

The first of these incidents began with the extension by you and the acceptance by me of an invitation to deliver an address before the National Rivers and Harbors Congress in Washington. When I finished delivering the address that incident was closed forever.

The second incident began when the National Rivers and Harbors Congress, after I had delivered my address, adopted a resolution in which it condemned the railways for opposing inland waterway development and declared that "no efforts from whatever source to defeat or delay that (waterway) program will be tolerated by the people of our country." In the ordinary course of my work I wrote an editorial criticizing this declaration, which was published in the *Railway Age* for December 27, and this was the "printed statement" with which you assert I "supplemented" my "platform utterances."

When did anybody except yourself regard it as reasonable or fair, because an editor had delivered an address before a convention, to condemn him as discourteous to those attending the convention because subsequently he published an editorial in the paper of which he was editor criticizing some action of that convention?

Surely you do not assume, that by accepting your invitation to address the Rivers and Harbors Congress, I obligated myself to refrain forever afterward from publishing any editorials regarding it or its resolutions or policies. Upon no other assumption, however, can you even attempt to justify your charge that I was discourteous to the members of that organization.

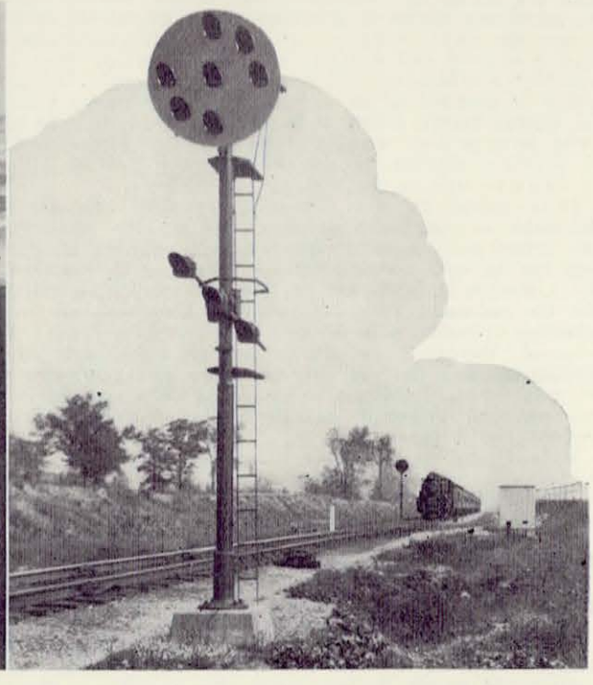
You undertake to show that the Rivers and Harbors Congress is tolerant of anti-waterway discussion by recalling that various railway men have been invited to speak before it in the past. What the attitude of the Congress was in the past cannot be accepted as indicating what it will be in the future, after it has adopted a resolution asserting that "no efforts from whatever source to defeat or delay that (waterway) program will be tolerated by the people of our country." While in that resolution the Rivers and Harbors Congress presumed to speak for the people, it actually was speaking only for itself. Discussion is one form of "effort" to "defeat or delay" the waterway program. How was I to know that the members of the Rivers and Harbors Congress intended to be tolerant of anti-waterway discussion in future when they declared in their resolution that "no efforts * * * to defeat or delay" the waterway program will be tolerated?

The editorial you criticized needs no defense. It speaks for itself. I do, however, most emphatically repudiate your implication that because I had spoken before the National Rivers and Harbors Congress there was any impropriety or discourtesy whatever in my subsequently publishing an editorial criticizing the resolutions subsequently adopted by it.

Pennsylvania Installs Centralized Traffic Control on 30.3 Miles of Single Track

Twelve minutes saved on each freight train stop—Second tracking deferred

The Control Machine at Limedale



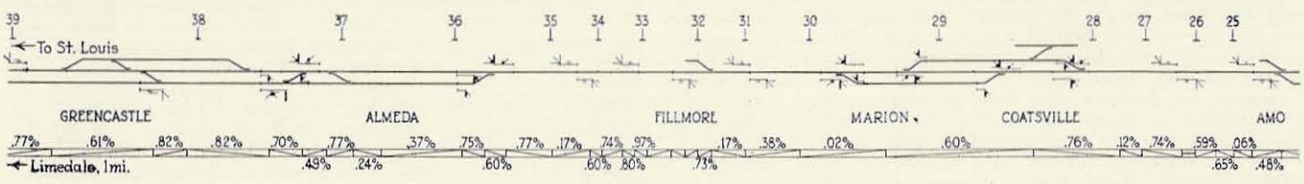
The Passing Track Switches Are Power Operated

THE Pennsylvania has recently completed an installation of centralized traffic control on 30.3 miles of single-track line between Ben Davis, Ind., and Almeda, which is a portion of the main line between Indianapolis, Ind., and St. Louis, Mo. As a result of the installation of this centralized control system for the 12 power-operated switches, and the 32 signals which direct the train movements without train order, the movement of trains, especially freights, has been greatly facilitated. This result is accomplished chiefly through the elimination of train stops at meeting points when entering and leaving the sidings which results in an estimated saving of 12 min. for each train stop eliminated.

Double track extends from Indianapolis to Ben Davis, 6.9 miles, and also from Almeda to Limedale, Ind., 3.1 miles, the second tracking of the intermediate section between Ben Davis and Almeda, 30.3 miles, having been postponed on account of proposed extensive line changes and grade revisions. This section of the line traverses a rather rough rolling country crossing several small streams, short grades of up to .83 per cent being numerous and in a few cases extending for about a mile. Curves are numerous, but not of a curvature to interfere with the normal operation of trains.

Traffic Characteristics of Line

The traffic on this division consists of 19 regular passenger trains and an average of 16 freight trains daily. Two of the passenger trains make eight local stops in the territory, while the remainder are on fast schedules making the 30.3 miles in 30 min. eastbound, and 32 min. westbound. Two of the freight trains are



Track and Signal Plan of the

locals and the remainder are on fast through schedules. The latest type locomotives are rated to handle 3,400 tons westbound and 3,250 tons eastbound, at a maximum speed of 50 m.p.h.

The passing sidings in this territory include advance tracks at Ben Davis and Almeda, a set of lap sidings at Marion, and a single siding at Gibson and Summit. On account of the grade conditions, serious delays were caused when trains were stopped to enter sidings at Summit and Gibson, so much difficulty being experienced at Gibson that this siding was used only when absolutely necessary. Train movements were operated by time-table and train orders, 40 to 45 train-orders being issued daily in this territory.

The solution of this operating problem was to install power-operated switches, which, together with the signals for directing train movements, are controlled from a central point. Operators had previously been employed at Summit and at the end of double track at Almeda, and one relief operator was required, making a total of seven men. By placing the centralized control machine in an existing interlocking tower at Limedale, where the Chicago, Indianapolis & Louisville crosses the Pennsylvania, the offices at Almeda and Summit were discontinued. Limedale is 3.5 miles west of Almeda.

The Control Machine

The control of the 12 field stations is assembled in the centralized machine. The term "station" designates a group of associated apparatus, such as a switch and the two or more signals governing movements over that switch and into the adjacent block. Each station is controlled by one panel in the control machine each of which includes a section of the track model, a two-position switch lever, a three-position signal lever, a stick button, and a code-starting button, arranged in order from top to bottom.

The centralized control system and the attendant switch and signal apparatus were furnished by the Union Switch & Signal Company and installed by the railroad company. Several new developments were incorporated in this installation. For example, this is the first extensive installation of the new three-wire coded relay control system, which was developed to give faster speed in sending out and returning the codes. When the operator is ready to line up the route for a train movement he sets the levers in the desired position and then pushes the starting button, after which only 1 1/5 sec. are required for the code to be transmitted to the field station, interpreted by the receiving unit and to start the operation of the switch and/ or signals. This one and one-fifth of a second is to be compared with about six seconds required with the two-wire coded system.

Power Switch Operation

A power-switch machine operates in about 16 sec., so that only about 18.5 sec. elapses from the time the operator pushes the button until he receives complete indication that the switch has completed its movement and is locked, and that the corresponding signal is displaying the proceed indication. If the switch is already in the desired position and the only change desired in the field is to change the signal indication, only 2 1/5 sec. elapses from the time the operator pushes the starting button until the indication is received.

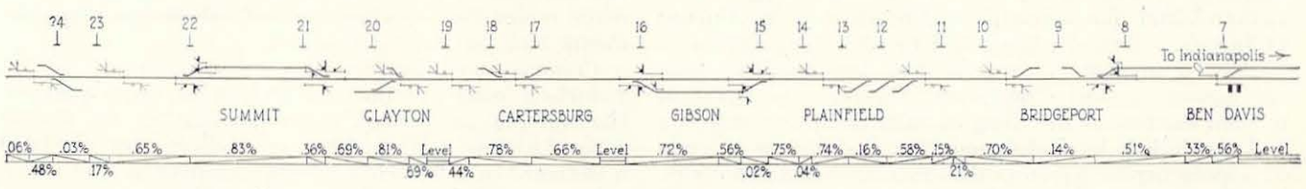
An unusual feature of the track diagram on the control machine is the continuous indication of the location of all trains on the entire territory; this feature was developed by the railroad company. One lamp is provided in the diagram for each track circuit or group of circuits, in the field, this lamp being extinguished only during the time the corresponding track circuits are occupied. These track sections are from 150 ft. to 3 mi. in length. Likewise, the lamps at the levers give continuous indication of the position of each switch and the indication displayed by each controlled signal.

Another new feature on this machine is the use of a second button for each panel on the machine. The top button is used to make the controlled signal "stick" or "non-stick" that is, if the button is left "in," the signal will not return to the proceed indication as an automatic signal does when a train has passed out of the block. However, if the button is pulled out the signal will return to the proceed indication for a following movement as soon as the preceding train has left the block, just as an automatic signal would do. The bottom button is for starting the controlling code, as used ordinarily on this type of machine.

Improvements have been made also in the train graph which automatically "OS"es the passing of trains at each power-operated switch. This train graph is a part of the control machine, being located in a recess in the desk at the base of the control panel. A new feature is that the graph needle assembly is so mounted that it can be slid forward or backward so as to be serviced from either the front or rear of the machine. Another feature is the new ink gage telltale needle, which ordinarily makes a continuous line at the edge of the train sheet, but when the ink level in the supply chamber sinks to a certain level, this line is discontinued, thus giving warning that the ink supply should be replenished. This warning is given at least four days before the ink is low enough to prevent operation of the recording pens.

Code Line Circuit

The three line wires for the coding control circuit are No. 9 hard-drawn copper with weatherproof covering. At each field station a five-conductor cable extends from the pole line to the concrete house. A tap connection is made to the common, which runs through, the other two wires being broken and the connection taken to the house where connections are made to a four-pole double-throw knife switch, which can be thrown to the reverse position to cut out the station in case of local trouble. Another switch is provided which may be thrown when the line is open beyond the particular station, so that the remainder of the territory from this station to the control point can continue in service.



Centralized Control Territory

I. C. C. Plans Inquiries Into Alleged Violations

WASHINGTON, D. C.

THE Interstate Commerce Commission is seeking additional appropriations from Congress for the purpose of strengthening the legal staff of its Bureau of Inquiry with a view to greater activity in the investigation and possible prosecution of alleged violations on the part of both railroads and shippers of the laws governing interstate commerce. Appropriations amounting to $9,412,473 for the work of the commission in the fiscal year 1932, recommended by the House appropriations committee in its report on the independent offices appropriation bill on January 21, include an increase of $26,660 for this purpose which had been recommended by the Budget bureau, and Commissioner McManamy, in his testimony before a sub-committee, outlined some of the matters which the commission would like to investigate if it had a large force for the purpose.

Before the commission at this time, he said, are eight instances of the control of one carrier by another "which, with adequate force, doubtless would be investigated in the light of the provisions of the Clayton act and possibly the Sherman act," and he gave a list of 15 classes of "important matters which we have been unable to investigate fully, or not at all, because of the lack of sufficient force." The commission has already issued three orders to railroads under the Clayton law, directing them to divest themselves of the stock of the Wheeling & Lake Erie, the Western Maryland and the Wabash and Lehigh Valley, none of which have gone fully into effect, and he mentioned another investigation now nearing completion, which, he said, has already consumed 54 man-months. It is understood that this refers to the complaint against the Southern for acquisition of control of the Mobile & Ohio.

Mr. McManamy did not mention the roads involved in the eight possible Clayton law cases, but members of the commission have at various times publicly indicated the opinion that Clayton law violations might be found in the relations between the Pennsylvania and the Norfolk & Western, the New Haven, the Boston & Maine, the Detroit, Toledo & Ironton, and the Pittsburgh & West Virginia, as well as in those of the Van Sweringen interests and the Alleghany Corporation in various roads. A large amount of information as to these relations is being collected by the House committee in connection with its investigation of railroad control and holding companies, which the commission has been aiding, and there is an element in the commission which is more interested in prying apart some of these roads under anti-trust laws than in putting them together into systems as urged by President Hoover.

He also said that developments in the investigation of forwarding companies "thus far indicate widespread rebating of at least a quasi-criminal nature which should be remedied by criminal action, or legislation, or both," and that a feature of the work of the Bureau of Inquiry which doubtless will become more extensive is that of institution of civil suits and ancillary proceedings to collect "recapture" money. In addition to such matters as the filing of false claims by shippers and mis-billing he mentioned: the practice of carriers of appointing as directors the officers of large shippers, for the purpose of according them favors to draw and control traffic; the waiving of demurrage charges; alleged violations of the provisions of section 10 of the Clayton act growing out of the purchase by one railroad of coal from operators in which the officers of the carrier have an interest and by another in the purchase of fuel oil from subsidiaries.

The appropriation bill provides for four additional attorneys and two special agents in the Bureau of Inquiry. The report on the bill says it is important that these matters receive suitable attention before action is barred by the statute of limitations.

The total appropriations recommended represent an increase of $82,510 as compared with those for the present year but a reduction of $63,120 as compared with the Budget estimate. The appropriation for valuation work is $3,554,368, or approximately the same as that for this year.

The total expenditure by the commission, for valuation work to December 31, 1930, is $38,703,099.46, according to the report. Under primary valuation of steam railroads, the field work, underlying reports, tentative valuations, and hearings are 100 per cent complete. Of the total of 1,035 tentative valuations, covering 243,237 miles of railroad, final reports have been reached as to 917, of which 287 were by default and 630 by decision, leaving 118 yet to be adopted. The commission is hopeful of finding the time necessary to dispose of the remaining 118 tentative valuations within the near future. The work of valuation of 196 short railroads, having a total mileage of 5,843 miles, which have come into existence since the completion of the field inventorying in 1921, is making satisfactory progress. No work has yet been undertaken on the valuation of "minor carriers," such as telephone companies, electric railways, pipe lines, and radio companies, valuation of the property of which is authorized by the act. The commission estimates the cost of such valuations as between $10,500,000 and $12,000,000, spread over a period of five or more years. The commission indicated it would not undertake this work until appropriations for the purpose have been granted by the Congress.

The work of bringing valuations down to date fell considerably into arrears because of curtailment of appropriations prior to 1928. Since that time, under increased appropriations, the status of this work has materially improved, and, at the present rate of progress, the commission expects to have all valuations as current as they can be by December 31, 1933.

To date a total of $10,649,615.16 has been paid by the carriers to the commission as one-half of their excess income preliminarily computed for the several recapture periods. The commission's recapture program now lists 298 roads, whose earnings in one or more of the recapture years 1920 to 1928, inclusive, is estimated to exceed 6 per cent of their valuations, the recapturable portion of which is estimated at $254,405,114.34. Investigations are pending in 129 other cases, with an estimated recapturable excess income of $20,971,907.

Commissioner Lewis testified before the sub-committee, however, that he was not willing to stand by the estimate of the recapturable excess because it was made under the O'Fallon method, which has been condemned by the Supreme Court.

Commissioner McManamy called attention to the reduction made by the commission in three years in the number of formal cases pending on its docket, from 2,852 in 1927 to 2,195 as of December 31, 1930, a decrease of 657. He said the commission was rather

(Continued on Page 245)

Air Conditioning on Passenger Equipment*

Development to secure greater comfort for passengers still in the pioneer stage—considerable progress is reported

By R. W. Waterfill

Carrier Engineering Company, Newark, N. J.

TRUE air conditioning is the production and maintenance of all the qualities of air, as near as practicable to the ideal for the service performed. The qualities at present most frequently controlled by air conditioning are temperature, humidity, purity, cleanliness, odors, motion and quietness. In some special applications, which are at present mainly experimental, qualities which change but little in nature are altered and controlled. These include pressures, oxygen content, the introduction or substitution of other gases and artificial light. Air conditioning may involve control of any or all of these qualities when benefiting the application practically.

The industrial or manufacturing field naturally was first to adopt and contribute to the development of the art, because its benefits, in uniformity and continuity of production, were most readily evaluated. The benefits of air conditioning for human comfort have been a little more difficult to evaluate in dollars and cents. These benefits accrue most directly to the individual in increased personal efficiency, improved health conditions and generally a greater enjoyment of life. This appreciation by the general public is yet mostly limited to the immediate sense of comfort, and it is this temporary comfort they seek in conditioned theatres. Some industrial leaders, however, are beginning to see financial profit in the increased human efficiency and reduction of sickness which proper air conditioning promotes.

It is erroneous to assume that air is healthy just because it has been conditioned. Like everything else air conditioning can be overdone, or poorly done. A great deal of harm is frequently done by so altering the properties of air that it is less desirable than originally.

The Ideal Conditions for Human Comfort

The ideal conditions or zones of comfort as established through the researches of the American Society of Heating and Ventilating Engineers for summer is an average of about 71 deg. F. effective temperature and for winter 66 deg. F. effective temperature. In winter this effective temperature may be maintained with a relative humidity sufficiently low to avoid objectionable condensation of moisture on windows. In summer the degree of cooling should be governed by the outside temperature to avoid severe contrasts. A schedule of desirable cooling conditions is shown in the table.

The general popular conception of air is that it is something to breathe, to supply oxygen. This is, indeed, an important function but hardly more important than the regulation of body temperature. The human body is a very complex machine, constantly evolving a relatively large amount of heat. This heat is sufficient to increase the dry bulb temperature of 30 cu. ft. of air per minute, 9 deg. F. It is thus generally conceded that a circulation of about 30 cu. ft. of air per minute per person is desirable for cooling purposes.

The cooling requirements greatly exceed the chemical, however, so that the cycle of restoring the desirable physical properties of the air needs to be more rapid than the renewal of the chemical balance. The average human being inhales about ⅓ cu. ft. of air per minute. Outdoor air contains about four parts CO_2 per 10,000 parts of air by volume. If this air is supplied to human beings at the rate of 30 cu. ft. per minute per person, the CO_2 content is increased to seven parts per 10,000 parts air. Experiments have failed to show any harmful effects to persons breathing air containing 300 to 400 parts per 10,000 with the corresponding oxygen reduction. General tendencies, which seem quite safe, are to introduce sufficient fresh air to limit the CO_2 content to about 15 parts per 10,000. This is a safety factor of at least 20.

Desirable Indoor Temperatures in Summer, Corresponding to Outdoor Temperatures*

Degrees Outside Dry bulb	Degrees Inside: Dry bulb	Degrees Inside: Wet bulb	Degrees Inside: Effective temp. deg. F.
95	80.0	65.2	73.4
90	78.0	64.5	72.2
85	76.5	64.0	71.1
80	75.0	63.5	70.2
75	73.5	63.0	69.3
70	72.0	62.5	68.2

* A. S. H. & V. E. Guide 1930, page 8.

While it might be absurd to subject human beings normally to high percentages of CO_2, there is sufficient evidence to indicate that with scientific air conditioning .07 per cent is equally arbitrary and absurd. Of course, it is desirable to take every practical means to eliminate bacteria, dust, odors, etc. These are readily minimized by filtering or washing, and uniform and positive circulation.

Each Factor Requires Independent Analysis

It is evident that each factor in air conditioning needs to be analyzed independently if satisfactory results are to be attained with the most effective utilization of energy. Considerable knowledge of the subject, however, and discretion in the curtailment of the outdoor air supply is required before such steps are taken. Especially is this true with poor circulation and distribution. Air

* Abstract of paper presented at a joint meeting of the New York Railroad Club and the Metropolitan Section of the American Society of Mechanical Engineers, January 16, 1931, at the Engineering Societies Building, 29 West thirty-ninth Street, New York.

stagnation and poor distribution are responsible for many air conditioning defects. Correctly applied air conditioning is a boon to health as well as relief from temporary discomfort.

Poor atmospheric conditions are gradually being corrected in buildings of many kinds, and more recently conditioned air has been pressed into service on moving cars. The only difference between conditioned air in theatres and in railroad cars is one of adaptation. In transportation, space and weight of the equipment involved in air conditioning are important. For this reason railroads and ships are in the best position of any transportation system to provide this phase of travel comfort with their service. Control of temperature, humidity, distribution, and dirt elimination are the principal functions of air conditioning on railways.

A complete air conditioning system comprises a source of refrigeration with auxiliaries, means for cleaning the air, for modifying its temperature or humidity as required, a well balanced system of air supply and distribution, complete control and functions in conjunction with standard heating equipment. The method of refrigeration is at present one of the most critical factors because of power and weight limitations. It is the most complex element of the air conditioning system, requires considerable power, and consequently seems subject to greater changes of adaptation. Proper distribution of the air supplied, at the correct temperatures and humidities, however, is just as important, and for the best practices in this regard air-conditioning engineers have a long record of experiences from which to draw.

[Here Mr. Waterfill gave a description of the equipment required in air-conditioning passenger cars. Descriptions of the Carrier equipment as applied to the Baltimore & Ohio diner, "Martha Washington," and to an Atchison, Topeka & Santa Fe diner were published in the August 9, 1930, page 267 and the August 23, 1930, page 362 issues of the *Railway Age,* respectively.—EDITOR.]

Automatic safety and operation of the refrigerant cycle have been secured. The water cooler is kept filled for efficient performance, without danger of liquid being carried to the compressor, by a thermostatic control on an automatic expansion valve. A back-pressure valve limits the minimum temperature above freezing and economizes on the reduced load power requirements.

The weight of the mechanical equipment involved in the conditioning of the air is approximately 10,000 lb. Power for the entire system is supplied by a generator when the car is in motion at a nominal speed. At other times storage batteries may be used and the capacity of these required is governed by the length of time a car may be standing and still in need of cooling. This additional weight is thus governed by the character of the run.

Most of the equipment is located to utilize corners available outside the car. The only actual floor space lost, which would be used for other purposes, is that occupied by the condenser-water cooling tower. Co-operative design with car builders may result in further adaptation of the air conditioning system to the least valuable space in the car.

The amount of raw, outdoor air is regulated by hand dampers. In very severe weather this is maintained at a predetermined minimum. As the qualities of the outdoor air approach those of the conditioned air, more outdoor air is used. This permits taking full advantage of the outdoor air, when it is in a satisfactory condition for use. One car thus equipped demonstrated its ability to carry temperatures of 67 deg. F. while crossing the hot arid stretches of parts of California with outside temperatures of 104 deg. F. While this temperature difference, as previously shown, is greater than desired, it at least demonstrated its potency.

Practical air conditioning for comfort in railway cars is only in its infancy. As a topic of discussion only, it did not progress far, and as a result is a bit behind some other air conditioning fields. These adaptations from other applications, however, are sufficiently successful to prove its practicability and worth. To accelerate refinements and avoid stagnation, it is essential that co-operation of specialists in every phase be maintained continuously.

Some of the future possibilities are new refrigerants, or systems employing steam or gaseous fuel. Electrification of lines through areas of dense population would greatly simplify the problems of the mechanical system. A mechanical-compression refrigeration system of the centrifugal type has reached an advanced stage of development. This will be constructed as a self-contained totally enclosing cooling unit. The cooler, condenser, compressor and motor drive will be in one assembly about 30 in. by 30 in. by 50 in., and weighing complete less than one ton. The only connections are the electric power and four water lines.

With the centrifugal type machine it is possible to use existing refrigerants which present no hazards. Carrene (CH_2Cl_2) and Trieline ($C_2H\ Cl_3$) are both water-white liquids at normal atmospheric pressures. They are non-flammable, non-irritant and can be carried in open containers like water. The operating pressures are below atmospheric so that any mechanical failure would not release the refrigerant charge. Further the high boiling points and high vapor density make the physiological hazards attendant upon the release of the refrigerant comparable to pouring kerosene on a floor, the comparative fire hazard, of course, being absent. These refrigerants have been used in many applications, particularly where human safety is involved, during the past five years.

Railway and Highway Competition

WASHINGTON, D. C.

ARGUMENTS on behalf of the railroads and the manufacturers of motor vehicles on the question of equalizing competition between the two forms of transportation were "given the air" on January 17 when Alfred P. Thom, general counsel of the Association of Railway Executives, and Pyke Johnson, Washington representative of the National Automobile Chamber of Commerce, spoke to the farmers by radio at the invitation of the National Grange during its weekly "hour" through station W.R.C. It was one of those so-called "debates" in which each speaker makes his own speech without much reference to the other.

Mr. Thom pointed out that the policy of strict governmental regulation of railroads was adopted when they practically constituted a monopoly in transportation, but that now "the only monopoly they have is a monopoly of legislation."

"The public's right to the selection of the agency of transportation which it wants and which it finds most useful must be respected, and the railroads will be no party to an effort to strangle and destroy, under the guise of regulation, any new agency of transporta-

tion which the public wants and which can serve it usefully," he said. "All that they ask is that the terms of competition shall be fair and that nothing shall be done which will impair or destroy existing agencies essential to the commerce of the people. Whatever is done must be done to improve transportation, not to impair or destroy it. No one can properly ask that any of the problems involved shall be solved in a way to give special privilege of special protection to any private interest. The supreme test must always be the interest of the public. But, subject to these limitations, the railroads believe that there should be equality of opportunity between the various agencies which serve the public in transportation. If one is regulated, the other should be similarly and appropriately regulated, but regulated fairly and not with a view of destruction but simply of establishing equality of opportunity for every agency that is found valuable to the public welfare. All the railroads ask is this equality of opportunity. The public should not be content until this equality between the various agencies of transportation and distribution of the products of human industry is firmly and finally established."

Mr. Johnson charged the "railroad-minded propagandists" with seeking to stifle highway transportation and to "restrict the movement of more than 26,000,000 private cars, trucks and busses over the public highway," and implied that they are trying to increase the taxes paid by the owners of all private automobiles and trucks, such as the farmers, who he said, own and operate nearly 5,000,000 passenger cars and almost 800,000 trucks. "One railroad witness after another has testified before the Interstate Commerce Commission," he said, "that it is the private automobile and the private truck which have taken most of the business they have lost."

He made the points that the trucks are giving a service which the railroads cannot give, by reason of their greater flexibility, and that in 1929 the railroads derived a revenue of more than $550,000,000 from 3,660,000 carloads of automotive freight, in addition to the freight handled to and from their lines by truck.

He said there are more than 3,500,000 trucks in the United States, more than 80 per cent of them belonging to private individuals, and that if the cost of business of the common carrier is increased the shipper will buy a truck and haul the goods himself, so that "the railroad in this respect is in the same position as the common carrier bus whose greatest competitor is the private passenger car."

Replying to the contention that motor transport does not pay adequately for its use of the highways Mr. Johnson cited the taxes paid by all motorists, saying:

"Government figures show that two-thirds of the cost of all the rural highway improvement in the United States last year, or about $1,000,000,000, was collected in special taxes alone from motor vehicle users. Of this total, more than $500,000,000 was paid in gasoline taxes alone. Not only are these taxes levied in every state, but every increase hits every private automobile and private truck owner as well as the commercial trucker. One fourth of all the special taxes were paid by truck owners, although these vehicles were but 11 per cent of the total.

"John E. Walker, noted tax economist, has just completed a study which shows that 21 states last year (1929) paid all the costs of all the roads in their state systems, from special motor taxes and that but 10 per cent of the $800,000,000 spent for this purpose in the country as a whole came from general taxes. The utmost the railroads could have paid was $30,000,000 for local road improvement which cost another $800,000,000. Could the railroads get along without these feeders?

"Let me make it clear that the motor industry holds no brief against the railroads. We believe in them and hold that their prosperity is essential to the nation. If they cannot fully serve the public because of restrictive regulation, then they should be relieved. But, we don't agree that your use of the motor vehicle has crippled the railroads or that they should be allowed to increase your costs simply to enable them to go on as they have in the past."

He said that a three-ton truck used as a common carrier costs 18 times as much for a registration permit as a private passenger car.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended January 10 amounted to 714,251 cars, a reduction of 148,210 cars, or 17 per cent, as compared with the corresponding week of last year and of 200,187 cars, or 21 per cent, as compared with 1929. Grain loading showed an increase of 40 cars as compared with last year, but other commodity classifications and all districts showed reductions as compared with both years. Loading of miscellaneous freight showed a reduction of 63,443 cars as compared with last year. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

Week Ended January 10, 1931

Districts	1931	1930	1929
Eastern	159,005	191,664	210,416
Allegheny	139,460	173,824	185,961
Pocahontas	44,930	59,203	57,935
Southern	111,739	136,616	139,946
Northwestern	86,073	102,970	103,990
Central Western	113,769	127,467	140,974
Southwestern	59,275	70,717	75,216
Total Western Districts	259,117	301,154	320,180
Total All Roads	714,251	862,461	914,438
Commodities			
Grain and Grain Products	39,546	39,506	44,114
Live Stock	27,251	29,703	32,011
Coal	164,890	196,756	213,541
Coke	8,957	10,695	11,691
Forest Products	29,988	49,307	53,939
Ore	5,167	9,120	9,724
Mdse. L. C. L.	202,356	227,835	234,885
Miscellaneous	236,096	299,539	314,533
January 10	714,251	862,461	914,438
January 3	615,382	775,755	798,682
December 27	.....	538,419	639,389
December 20	.....	713,810	842,775
December 13	.....	744,443	922,861

The freight car surplus for the week ended January 8 averaged 697,332 cars, a decrease of 9,206 cars as compared with the record figure for the last week of December. The total included 373,549 box cars, 251,862 coal cars, 30,527 stock cars and 15,839 refrigerator cars.

Car Loading in Canada

Revenue car loadings at stations in Canada for the week ended January 10 totaled 43,966 cars, an increase over the previous week of 7,617 cars but a decrease of 7,950 cars from the same week last year.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada		
January 10, 1931	43,966	24,773
January 3, 1931	36,349	21,966
December 27, 1930	35,087	23,240
January 11, 1930	51,916	32,660
Cumulative Totals for Canada		
January 10, 1931	80,315	46,739
January 11, 1930	96,346	63,907
January 12, 1929	103,208	66,944

More Draft Gear Developments

ON January 16, the Federal Trade Commission resumed at Chicago, after a suspension of six months, its hearings on its complaint against the Waugh Equipment Company and certain officers of Armour & Co., alleging unfair competition through the use of the packers' traffic in promoting the sale of draft gear. It was disclosed during this hearing that members of the Swift family, as well as officers of Armour & Co., now own stock in the Waugh Equipment Company. G. A. Hood, testified that he was trustee of 1,666 shares of Waugh Equipment stock, consisting of 422 shares for L. F. Swift, 316 shares for E. W. Swift, 219 shares for C. H. Swift, 167 shares for G. H. Swift, 186 shares for H. H. Swift, Jr., and 147 shares for A. B. Swift. The total number of shares held by the Swift family is the same as that previously shown to have been issued in 1924 by A. J. Pizzini, president of the Waugh Equipment Company, to officers of Armour & Co. Considering the total number of shares of the Waugh Equipment Company owned by the Swift family, and the number of shares which the record indicates is owned by present or former officers of Armour & Co., comprising 1,000 shares belonging to the estate of the late F. Edson White, 1,069 shares belonging to Arthur Meeker, 1,069 shares belonging to F. W. Ellis and 409 shares belonging to J. B. Scott, or a total of 3,547 shares, it appears that a controlling percentage of the Waugh Equipment Company stock is held by persons identified with the two packing houses.

J. M. Waugh, inventor of the Waugh draft gear and president of the Waugh Draft Gear Company before he sold out to the Waugh Equipment Company in 1924, testified that when he was in active charge of the draft gear sales he directed his attention to the superintendents of car departments and of motive power. He submitted a statement of the business done from 1910 to 1921 and testified that the volume of sales was greater in the earlier part of that period than in the latter part. No dividends were paid since 1911, but he explained that this was by reason of litigation which cost the company $115,000. Over half of the gear sold by the old company in 1924, the figures showed, were for the Armour Car Lines, under a contract which A. L. Bolte had arranged with F. W. Ellis. He explained that he was in Mr. Pizzini's office when a telegram was received from Mr. Bolte and had wired him to take the order at the best price possible. He said he had not discussed traffic with the Armour officers and did not know what Mr. Pizzini intended to do at the time with the several thousand shares of stock in the new company which the agreement stipulated Mr. Pizzini and an associate "may use as they desire."

A statement submitted by the Waugh Equipment Company showed that this company's sales of draft gear to the railroads since its organization were as follows:

1924	1,008 gear
1925	4,473 gear
1926	8,190 gear
1927	17,541 gear
1928	23,933 gear
1929	59,475 gear
1930	30,992 gear

A condensed summary of the sales made to the larger purchasers of the gear, computed from detailed statements in the record, is shown in the next table.

A. J. Sams, a manufacturer's agent, was questioned about certain correspondence with railway officers and the Waugh Equipment Company. On October 30, 1925, Mr. Sams wrote a letter to B. G. Wood, vice-president of purchases of the St. Louis-San Francisco, in which he said in part:

> Manager O'Brien, whom you met with some of your traffic officers last week, had the impression we were scheduled for 500 cars because of the traffic department's wish that we be given that number regardless of what additional number the mechanical department proposed to give us..... I doubted the correctness of this because I did not believe that another department would intervene in a case of this kind..... I had made the representation to Mr. Worman that our company did not propose to force an issue by any other means..... But, it now appears that the equipment company has thought that their traffic connection was sufficiently interesting to the Frisco to be used in our behalf.

In another letter written to Mr. Wood on November 30, 1925, Mr. Sams said in part:

> I might say to you in confidence that I think our people have definitely decided to abandon their old idea of trying to get draft gear business on any other plan than to handle direct with the purchasing and mechanical departments.

Mr. Sams said that he was asked to represent the Waugh Equipment Company by W. H. Bentley, the sales manager, and that he had written Mr. Wood after

Sales of Waugh Gear

	1926	1927	1928	1929	1930
B. & O.	....	400	2	250	2
Bang. & Aroos.	....	5	....	....	....
B. & M.	80	102	163	2,301	....
C. & O.	....	....	....	3	6,000
C. B. & Q.	....	....	118	504	800
C. M. St. P. & P.	110	204	1,500	2,202	1,400
C. St. P. M. & O.	8	20	66	154	....
C. & E. I.	....	300	301	....	....
C. R. I. & P.	10	88	32	6,044	1,180
C. P.	....	....	1,848	289	....
C. & N. W.	5,218	9,626	9,941	8,272	802
D. L. & W.	200	400	102	1,100	....
Erie	....	93	1,667	2,421	1,901
H. V.	....	....	....	....	2,000
I. C.	7	....	....	....	400
L. V.	....	512	....	1,203	....
L. I.	228	258	24	....	2
Soo	....	....	....	....	400
M. P.	510	3,288	109	5,199	4,058
M-K-T.	....	....	....	....	1,000
N. Y. C. & St. L.	10	....	2	556	....
N. Y. N. H. & H.	....	200	97	49	713
N. Y. C.	82	178	140	8,355	2,202
P. M.	....	....	....	275	6,885
Penn.	....	26	2,986	10,642	1
Reading	1,340	1,015	629	105	5
S. A. L.	....	....	....	....	1,000
St. L.-S. F.	200	....	2,000	5,602	....
S. P.	101	184	175	329	....
U. P.	426	300	267	60	2
Virginian	....	....	1,000	....	....

Mr. O'Brien, manager of the Chicago office of the Waugh Equipment Company, had informed him that he had seen traffic officers on the St. Louis-San Francisco and thought the Waugh Equipment Company would get more orders than anticipated by Mr. Sams. It had been his practice, he explained, to deal exclusively with mechanical and purchasing officers in railway sales work, and he wrote the first letter to Mr. Wood for the purpose of trying to disabuse the latter's mind that "we were going around him to get business." He said he was later given to understand by Mr. Bentley that F. W. Ellis and Arthur Meeker were stockholders and directors in the Waugh Equipment Company and that it would be very beneficial to use their names in the sales work. Mr. Sams was also questioned about a report to W. H. Bentley on March 16, 1926, in which Mr. Sams, referring to his experiences on the Chicago & Alton said in part:

> I had a very satisfactory talk with our friend Seidel..... While he cannot get his little peeve entirely out of his system, he has agreed to go along with us..... While we were discussing the draft gear, I had opportunity to tell him that there really was a traffic matter involved and that if he would forget and forgive and get busy with us, the Armour Car Line people would very greatly appreciate the business..... and it would strengthen the Chicago & Alton with them materially.

Mr. Sams testified that Mr. Seidel, then general superintendent of motive power of the Chicago & Alton,

was "sore" because some one from the Waugh Equipment Company had called upon him and tried to force him to buy its gear. Mr. Sams testified that Mr. Seidel at first did not wish to talk to him, as a result of that experience, but subsequently said he wanted to aid his traffic department all he could.

R. J. Cook, president of the Keyoke Railway Equipment Company, maker of the Murray gear, submitted a list of the company's draft gear sales, amounting to 25,577 gear in 1924, 11,914 in 1925, 12,752 in 1926, 18,070 in 1927, 4,358 in 1928, 12,600 in 1929 and 601 in 1930. He said the practice in selling these gear has been to call on the mechanical and purchasing officers of railroads, but never upon traffic officers. At the outset, he attributed the complete loss of business on the roads which were his two best customers to business conditions and said that changes in personnel were also effective. Questioned about draft gear sales on the Pere Marquette in 1929, the first year that Murray gears were not specified exclusively on that road, he said that the 200 sets of gear purchased by the Pere Marquette during 1929 from other companies were divided between the Waugh and Durable. He also testified that the superintendent of motive power wanted to include the Murray gear in specifications for 1930 purchases but he understood, it was not allowed by W. G. Black, whose jurisdiction had been extended over mechanical matters on the Pere Marquette that year.

J. A. Slater, sales manager of the National Malleable Castings Company, manufacturer of the National gear, testified that the selling activities of that company had been confined to the mechanical and purchasing departments and when asked if he had noticed any changes in selling conditions in recent years, explained that Keyoke and Bradford used to be strenuous competition but had apparently dropped out of the picture while the Waugh competition was strong and encountered everywhere, adding that he felt the Waugh competition more than that of any other company. He testified that he did not know by what method the Waugh Equipment Company got a division of business on certain roads which had been buying all gear for freight cars from his company but said that no complaints about the National gear had been received from these roads and that price changes had been downward.

G. E. White, general freight agent of the Rock Island, was questioned concerning various records and correspondence in the files of that road relating to the purchase of Waugh draft gear and the traffic of Armour & Co., including a letter written on March 4, 1929, notifying J. A. Roach, general agent, of an order placed with the Waugh Equipment Company for 1,000 sets of gear; also a letter from Mr. Roach, written on the following day, notifying Mr. White that Mr. Roach had got certain business from Armour & Company "in lieu of the order." Mr. White, when questioned about the comparative statistics on Armour & Company's traffic for the years 1929 and 1928 which he and Mr. Roach had prepared for Mr. McKenzie, vice-president of traffic and which showed an average increase of 189 cars a month in 1929, recalled that the Waugh Equipment Company had been mentioned in connection with the statement but he did not recall what was said. In cross-examination, Mr. White testified that he did not know the respondents and that there was nothing unusual in preparing traffic statements of this kind.

A. MacKenzie, vice-president and traffic manager of the Chicago, Rock Island & Pacific, testified that he first understood that Armour & Co. "owned" the Waugh Equipment Company, but later found that it was employees of Armour & Co. who "owned" it. He said he knew that Mr. Ellis was interested in the company before he talked to him about draft gear orders which the Rock Island had placed with the Waugh Equipment Company in 1929 and that this knowledge was not acquired from Mr. Gorman or W. H. Miner, as suggested by the attorney for the respondent, but came direct from Mr. Ellis.

On Monday, January 19, A. L. Humphrey, president, Westinghouse Air Brake Company and the Union Switch & Signal Co., traced the draft gear business from the invention of the first friction gear by George Westinghouse up to a recent sale of the Westinghouse gear to the Union Draft Gear Company. He said the promotion of Westinghouse gear sales had been handled in the same manner as all other inventions of Mr. Westinghouse, the agents calling on railway executives interested in the economies likely to result from the use of the gear. The question of traffic, he said, was not involved. No competition in the friction gear was experienced, he said, until the expiration of the Westinghouse patents, when several companies began to manufacture friction gear. His attention having been called to the decline in the sale of the Westinghouse gear, shown by a statement in the record that 42,000 gear were sold in 1924, 13,000 in 1925, 32,000 in 1926, 22,000 in 1927, 21,000 in 1928 and 5,000 in 1929, he cited as the cause of this decline that several of the new companies resorted to methods that the Westinghouse Company would not follow. The Westinghouse Company, he said, would stand behind the quality of material and workmanship in its gear, but was not in sympathy with the practice of guaranteeing gear for as long a period as 15 and 18 years. Westinghouse, he also said, had but one price at which it would sell its gear. He said that he had no personal knowledge that traffic was a factor in the competition but testified that such reports were frequent on the part of salesmen. He further explained, however, that he had never received "a single concrete fact" from any salesman showing that the Westinghouse Company had lost business on that account.

C. M. House, superintendent of motive power and equipment of the Chicago & Alton, when asked for his reason for specifying Waugh draft gear for certain equipment on that road, testified that it was the policy of W. G. Bierd, receiver, to buy on a reciprocal basis and that he had been asked by A. P. Titus, at that time vice-president in charge of operation of the Alton, to specify the gear for traffic reasons. W. G. Black was questioned at length on January 19 as to the reasons for the large purchases of draft gear made from the Waugh Equipment Company for use on the Chesapeake & Ohio, the Hocking Valley and the Pere Marquette in 1930, and insisted that he had specified these gear solely on the basis of merit.

On January 20, Julius H. Reisse, mechanical assistant to the vice-president of the Chicago, Burlington & Quincy, recalled to supplement his testimony of June 16, 1930, said that the Waugh gear was first used on the Burlington in 1927, when 50 car sets were purchased, the gear of another manufacturer being standard on the Burlington at that time. The standard gear meant nothing in traffic tonnage, he said, and it was felt that the other gear might have an influence on the tonnage being shipped over the Burlington. It was understood in his own organization, he said, that the traffic influence in that draft gear purchase would come from Armour & Co.

The hearing at Chicago was adjourned on January 20, but was resumed on January 22 after a day's hearing in St. Louis, Mo.

The Electric Locomotive

By H. L.
Chief Engineer, Transportation

"The steam locomotive is so successful . . . . that there should be some good reason for considering other types of motive power"

THE steam railroad or trunk line transportation industry may be divided as follows: (1) Suburban service; (2) main line trains in terminal areas; (3) switching in terminal areas; (4) branch line freight and passenger service; and (5) main line long haul freight and passenger service.

In each of these fields modern electrical equipment makes an important contribution—either in reduction of smoke or noise and reduction in running time (thereby permitting faster and more comfortable means of transportation for the public)—or by effecting a reduction in fuel, labor, and maintenance (thus making it possible to handle a ton-mile at a lower cost).

The steam locomotive is so generally used, and is so successful in meeting the demands of an exacting transportation system, that there should be some good reason for considering other types of motive power.

Suburban Service

The most recent suburban operations to adopt modern electrical equipment are the Pennsylvania and Reading electrifications at Philadelphia and the Delaware, Lackawanna & Western electrification at Hoboken. In all of these electrical equipment has played a most important part.

The Pennsylvania and Reading electrifications using the 11,000-volt, 25-cycle, a-c. system are outstanding, not particularly for the magnitude of the suburban undertaking, but for the fact that the initial suburban electrification is an integral part of an extensive project.

While weight reduction in this class of service is not as important as in other forms of transportation, it is of interest to point out the progress made in the single-phase commutator motor in this respect. This is shown by Fig. 1, which indicates a reduction in weight from 50 lb. to 25 lb. per continuous horsepower output, a saving of 50 per cent. While this in itself is an outstanding contribution, it is of particular interest to note that coincident with this weight reduction the number of poles used with the single-phase motor has been doubled, roller bearings have been introduced, the commutating capacity has been increased to permit a 25-per cent increase in the rates of acceleration and the brush life has been increased from 12,000 miles to 60,000 miles, or nearly five times the life secured with the older type motors.

With the advancement in motor design, the type of control has been improved from the individually operated electro-pneumatic switch unit, involving a large number of interlocks and magnet valves, to a type using cam operation of the valves with a resultant decrease in the weight of 37 per cent.

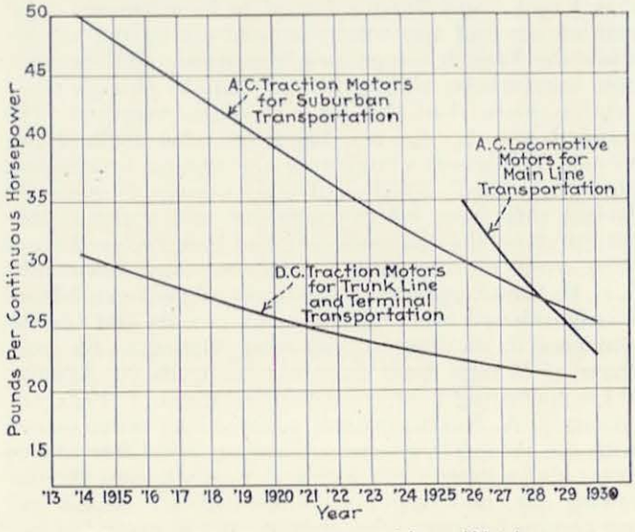


Fig. 1—Effect of Design on Motor Weight

To put it another way, the weight of a two-motor equipment, such as used in these two most recent a-c. electrifications, has been reduced from 96 lb. to 56 lb. per continuous hp. output, a reduction of 42 per cent over the equipment used 15 years ago and a reduction of 16 per cent over that used less than five years ago. Coincident with this reduction in weight, the commutating capacity has been increased 25 per cent and the brush life multiplied five times.

Remarkable advances have been made in the protective equipment for these 11,000-volt distribution circuits, the most notable achievement being the high-speed air cir-

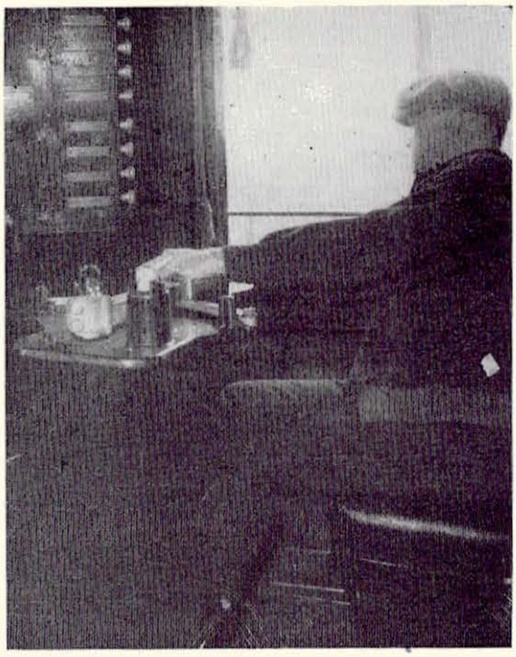
* Abstract of a paper presented before the New York Railroad Club, November 21, 1930.

Improves Its Capability*

Andrews

Department, General Electric Company

Continuous reduction of weight and increases in power and efficiency of motors, control apparatus and rectifiers improve the performance of electric locomotives and cars



cuit breaker (installed out of doors). This breaker will interrupt a short circuit current value of 50,000 amp. in .04 sec., or within a single cycle of a 25-cycle wave.

The Delaware, Lackawanna & Western suburban electrification is outstanding in two respects. First, it is the initial suburban project in this country to utilize the 3000-volt direct-current system for multiple-unit

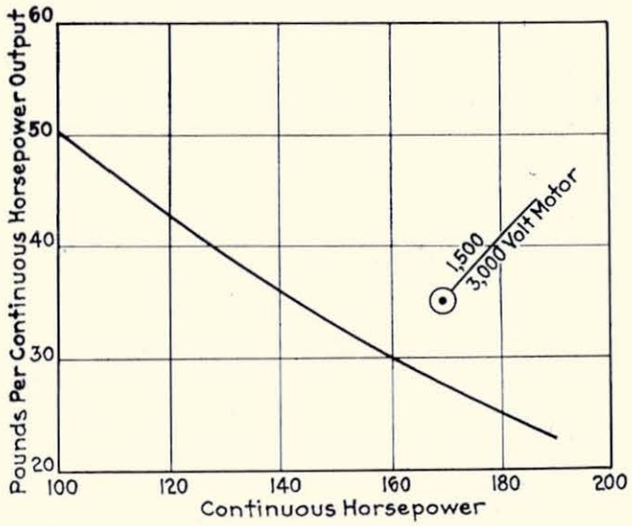


Fig. 2—Ratio of Weight to Horsepower for 600-Volt Direct Current Motors

cars, as well as the first project of its magnitude in the world to use this system in suburban service; and second, it is the first steam railroad operation of any magnitude in the world to rely entirely on 3000-volt mercury-arc rectifiers as conversion units.

Great credit is due the railroad for its foresight in proceeding with this electrification and to the railroad company's consulting engineers for their judgment, courage and faith in the ability of the manufacturers of electrical equipment to meet the exacting demands of their transportation requirements.

The most noteworthy contribution to the multiple-unit cars of this project is the traction motor, which has a weight of 35½ lb. per continuous horsepower, the lightest weight self-ventilated suburban traction motor in the world. There are no motors of similar design in this country with which a comparison can be made to indicate the progress in this respect.

However, some idea of the progress is gained from Fig. 2, which gives the weights of 600-volt railway motors per continuous horsepower output used in rapid transit service. On this chart is shown the weight per horsepower of the 3000-volt motor used on the Lackawanna, showing a weight factor within 25 per cent of the 600-volt motors of similar rating.

The mercury-arc rectifier equipment, 40,000-kw. of which is in operation on this project, is a distinct contribution both from the standpoint of efficiency and floor space occupied. This is shown by Fig. 3, which gives the relative efficiency of a 3000-volt rectifier substation including its transformer and corresponding motor-generator set. Attention is particularly directed to the high efficiency of the rectifier itself, (98.7 per cent at full load) and the high over-all efficiency of the substation, including the transformers and rectifiers (97 per cent at full load), a gain of 10 per cent in efficiency over a motor-generator set station of similar capacity. This in itself, of course, makes a material reduction in the amount of power used and contributes to the high over-all efficiency of this system from three-phase a-c. power to the wheel of the transportation unit.

Aside from the increased efficiency, which is of primary importance, the mercury-arc rectifier further contributes by reducing weight and floor space per kilowatt output. The effect is a reduction in weight of equipment of 45 per cent; in floor space of 50 per cent; in cubical contents of building of 75 per cent; in cost of building of 57 per cent. These advantages are in themselves major contributions to the transportation industry.

The suburban service of the Lackawanna under steam operation handled twenty million commuter passengers during 1929, operated 220 passenger trains daily and 30 suburban passenger trains during the peak hour.

Under electrical operation, 141 cars equipped with motors having a total capacity of 133,000 hp. replaced 120 steam locomotives with an aggregate capacity of 180,000 hp. The distribution of the motors throughout

the train, rather than the concentration of all tractive effort in the drivers of the steam locomotive, makes it possible to increase the rates of acceleration with a resultant reduction of 25 per cent in running time.

The reduction in terminal time and the higher schedule speeds secured under electrical operation permit increasing the frequency of service. The total number of suburban trains operated per day under complete electrical operation will be 167, or an increase of 12 per cent over the corresponding steam service.

Terminal Projects

The most recent terminal where modern electrical equipment has contributed to handling main line trains is the 17-mile electrification of the Cleveland Union Terminal Company. This installation uses the 3000-volt direct-current system and is the first project of its kind in the East to use a high voltage direct-current system, under heavy passenger traffic conditions. There are twenty-two 3000-hp. locomotives operating in this zone, or 1.3 locomotives per mile of route, all handled from two substations with a total installed capacity of 15,000 kw.

The principal contribution of modern electrical equipment to this project is the motive power unit weighing 204 tons. In order to secure this weight, which is required for traction purposes on a limiting grade, it was necessary to add more than 12 tons of ballast. In other words, the locomotive could have been built for 192 total tons weight, or 145 lb. per continuous horsepower output.

The greatest single improvement in this motive power unit is the traction motor, which weighs 21 lb. per continuous horsepower output. The progress made in increasing the output per pound of material in direct-current high-voltage locomotive motors is shown by Fig. 1, which indicates a reduction from 30 lb. to 21 lb. per horsepower output, or a saving of 30 per cent.

The use of high-speed air circuit breakers as protection to and for sectionalizing the distribution systems is

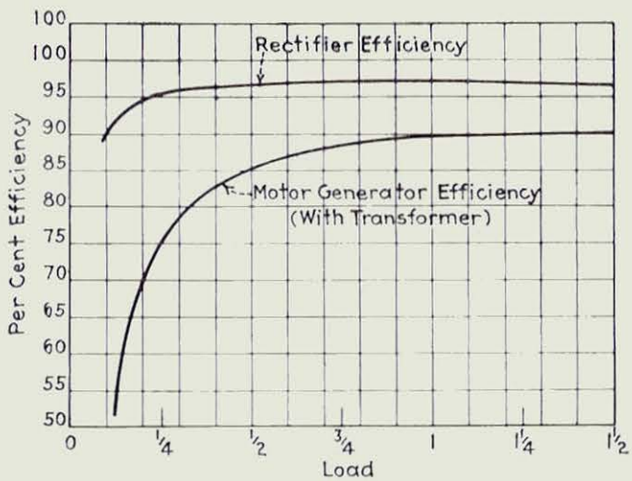


Fig. 3—Curves Showing Efficiencies of a 3000-Kw. Mercury-Arc Rectifier and a 3000-Kw. Synchronous Motor-Generator Set

an important accomplishment. These circuit breakers will interrupt a short circuit current of 40,000 amperes in .008 second.

Switching Service

There are three types of electrical transportation units available for switching service on the steam railroads: 1. The straight electric locomotive deriving its power from an overhead wire or third rail; 2. The internal combustion engine locomotive, deriving its power from an internal combustion engine located on the transportation unit; 3. The internal combustion engine locomotive, deriving its power from an internal combustion engine in combination with a storage battery located on the transportation unit.

The first of these, the straight electric locomotive, uses central station power and, on account of the unlimited

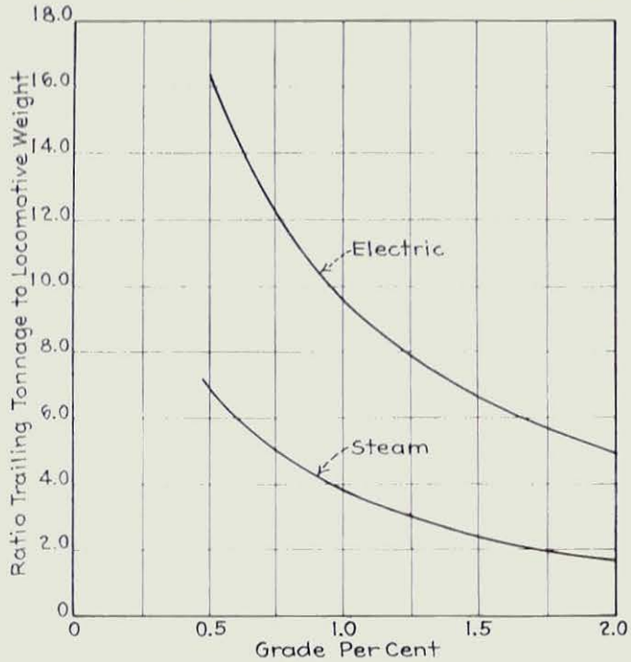


Fig. 4—Performance Curves for Electric and Steam Locomotives in Freight Service

source of supply is the most powerful and effective of the three types where large power units are required. Its tractive power is limited, as in all cases by the weight on drivers, but the speed at which this tractive power is obtained is only a question of motor capacity.

By reason of the fact that there are practically no reciprocating parts in a locomotive of this type, it reduces maintenance costs compared with a steam locomotive, 75 per cent. For the same reason the percentage of time it is available for service is higher and this reduces the number of units in service 50 per cent. As it receives its power supply from a continuous overhead conductor it can be constructed with all weight on drivers, i.e., useful weight, and thus reduces the total weight per pound of starting tractive effort 50 per cent. Likewise, it uses power only when it is required for movement, has practically no standby losses and thus reduces the fuel expense from 40 to 60 per cent, depending on the relative price of coal and electrical energy. Because it is more easily handled, has unlimited power supply, is usually constructed with all weight on drivers and can be more easily reversed in direction of movement, it reduces the time to handle a ton-mile 30 per cent. Finally, as a result of these gains, it reduces operating costs per hour of the motive power unit 25 to 50 per cent, depending on the number of hours per day operated. It also eliminates coal, water, ash handling facilities, wyes and turntables.

The second transportation unit, utilizing electrical equipment with an internal combustion engine, differs from the straight electric locomotive in that the prime mover is located in the engine cab and therefore no external power supply system is required. In addition to having the advantage of being a self-contained unit, this

type of motive power, where Diesel engines are used, has the highest thermal efficiency and the lowest fuel consumption of any in general use; this holds true in engines of relatively small power.

As an illustration of fuel economy of a Diesel engine, a 300-hp. machine will deliver a brake horsepower hour at full load with a consumption of .43 lb. of fuel. This means generating a kilowatt hour of electrical output for about 12,000 B.t.u., a performance which compares favorably with the best of modern steam power stations. Even in transportation service where the load factor is relatively low, this engine will give an output of 7 kilowatt-hours per gallon of oil, or about 20,000 B.t.u. kw. per hour.

The third transportation unit, using electrical equipment with internal combustion engine and storage battery motive power, differs from the straight Diesel-electric locomotive in that a storage battery is used to replace a portion of the power which would normally be supplied by an internal combustion engine, and one of the chief functions of the engine is to keep the battery fully charged. The storage battery will permit high current discharges for short periods of time, and such a motive power unit is therefore well adapted to switching work.

Owing to the fact that a locomotive of this type permits operating the Diesel engine at constant speed and at a high load factor, the thermal efficiency of the power plant engine and battery does not differ greatly from a straight Diesel-electric locomotive, i.e., in switching service it will deliver approximately 7½ kw.-hr. of electrical energy per gallon of fuel, or about 19,000 B.t.u.

The Straight Oil-Electric

The advantages of the straight oil-electric locomotive, or oil-battery-electric locomotive are its low fuel costs, high availability, the absence of a power supply system along the right of way, and its low maintenance in comparison with steam motive power.

Its chief disadvantages are its high weight per continuous horsepower output, and its high initial cost; although a locomotive of this type, which replaces two steam locomotives and reduces fuel costs by 75 per cent, has few apologies to offer for its initial cost.

The Diesel-electric with or without storage battery, is in fact an electric locomotive with the prime mover located on it. For this reason, it reduces maintenance expense 30 per cent, and for similar reasons it reduces the number of units for a given service 50 per cent. As it can be constructed with all weight on drivers, it reduces the weight per pound of starting tractive effort 50 per cent.

Owing to the high thermal efficiency of the Diesel engine, and to the fact that this type of motive power has small stand-by losses, it reduces the fuel expense 50 to 70 per cent, depending on the relative price of coal and oil. Because of its ease in handling, more rapid acceleration and ease in reversal of direction, it reduces the time to handle a ton-mile 30 per cent. Finally, it reduces operating costs 25 to 50 per cent, depending on the character of service in which it is operated.

Branch Line Passenger Service

The principal contribution of modern electrical equipment in branch line passenger service is electric transmission for gasoline motor cars. The electrical transmission has made possible the development of the present type of gasoline motor car, using large capacity, internal combustion engines.

As this unit also provides space for passengers and commodities, it inherently weighs less per horsepower output than a steam passenger train, and it reduces the dead weight per seat 50 to 70 per cent, depending on the size of unit. Likewise, its ease of operation, which permits eliminating a portion of the usual train crew reduces train crew expense 35 per cent.

As it uses fuel only when power is demanded and has small stand-by losses, its contribution to this item is to reduce fuel costs 50 per cent. Its simplicity permits a reduction in maintenance of 65 per cent, and it reduces the cost per train mile 50 per cent. Coal, water, ash handling facilities, wyes and turntables are not required.

Main Line Long Haul Freight and Passenger Service

In main line long haul freight and passenger service, the roads which have most recently adopted modern electrical equipment to meet the demands of this phase of transportation are the Pennsylvania and New York Central.

The Pennsylvania Railroad, using the 11,000-volt, 25-cycle, a. c. system, has adopted two types of high-speed passenger locomotives and one type of freight locomotive. These are of unusual interest in that the horsepower capacity installed per axle is higher than any other installation in this country. Each axle of this company's passenger locomotives is equipped with twin motors having a combined continuous rating of 1250 hp. Its two driving axle, 2500-hp. passenger locomotive has a total weight of 125 lb. per continuous horsepower output and the weight on drivers is 65 lb. per continuous horsepower output. In comparison with other locomotives of the same type this represents a reduction in the total weight per horsepower.

The three driving-axle 3600-hp. passenger locomotive has a total weight of 125 lb. per continuous horsepower output, a reduction of 21 per cent over previous locomotives of this type.

Table I—Trunk Line Electrification, Comparison Of the Saving in Operating Expenses in Favor of Electrification in Percentage of the Cost for the Item Under Steam Operation

	Road 1	Road 2	Road 3	Road 4	Road 5	Aver.
Locomotive Repairs	31	91	64	70	83	70
Enginehouse	42	50	60	61	80	66
Lubricants	53	97	19	10	79	60
Water	77	0	100	100	..	..
Supplies	28	..	69	47	65	62
Enginemen	37	53	42	58	72	51
Trainmen	27	50	33	55	..	41
Total	36	62	41	54	78	52

Table II—Return On Investment, Trunk Line Electrification

Year	Route Miles Electrified	Capital Employed In Fixed Installations	Savings Realized	Savings In Per Cent of Capital Employed
1922	*27	$1,215,400	$390,200	32.1
1923	27	1,215,400	347,200	28.6
1924	27	1,215,400	252,700	20.8
1925	27	1,401,400	347,400	24.8
1926	58	2,238,100	423,800	18.2
1927	83	3,430,900	608,600	17.7
1928	177	3,784,700	794,500	21.0
1929	177	7,633,800	1,446,000	18.9

The principal contribution of modern electrical equipment to this type of motive power units is shown by Fig. 1, which gives the reductions in weight per horsepower on single-phase commutator motors and indicates a reduction from 34 lb. to 22½ lb., or 35 per cent. This is a remarkable achievement and particularly so when, coincident with this weight reduction, the number of poles in the motor has been increased 50 per cent, thus increasing the commutating capacity and materially increasing the life of the brushes.

The road freight locomotive for the New York Central, with all weight on drivers, has a total weight of 100 lb. per continuous horsepower output. In this type of motive power, as well as similar types for passenger service, the traction motor has been the principal con-

tributing factor. Modern motors for this class of service weigh about 18 lb. per continuous horsepower output, which is a reduction of 33 per cent from the weight of the motors in use less than five years ago.

As a result of the higher output per pound of material on the part of modern electrical equipment, the complete electric motive power unit, in comparison with other types of motive power, makes an outstanding contribution to the transportation industry. The number of units in service is reduced 50 per cent; total weight per horsepower output 47 per cent; maintenance expense 75 per cent; non-useful weight 70 per cent.

These contributions on the part of the electric locomotive result in a greatly superior train performance as shown by Fig. 4. These show freight train performance. Curves for passenger train service are similar in appearance. In freight service the electric locomotive can handle from sixteen to five times its weight and the steam locomotives from seven to two times its weight. In passenger service this ratio for an electric locomotive varies from ten to three times its total weight, while on a steam locomotive the ratio varies from five to one times its weight.

This performance on the part of the electric locomotive permits a reduction in operating costs and consequently the handling of a ton-mile at a lower cost. The data given in Table I show the savings in operating expense in per cent of the cost of the corresponding item of steam operation. Data are shown on five trunk line electrifications giving reductions in operating costs. The average of all savings is equivalent to 52 per cent of the cost under steam operation.

Even with these substantial reductions one naturally asks the question whether they are sufficient to pay a fair return on the capital invested. In these particular illustrations the answer is without question "yes" as they are installations which have been in operation for an appreciable period and the results are well known.

The information in Table II, shows the results actually secured. The value of the savings realized is shown as well as these savings expressed in per cent of the capital employed. These have varied through a period of eight years from a return of 19 to 32 per cent of the capital invested, which can be considered as a reasonable return.

Rates On Alaska Railroad to be Increased

WASHINGTON, D. C.

TWO widely-held theories regarding the effects of government ownership and operation of railroads have just been exploded in the case of the Alaska Railroad. One of these is that the government is supposed always to reduce rates. But it has just been announced that the freight rates of the Alaska Railroad are to be raised so as to produce a 50 per cent increase in revenue and that the passenger fares are to be advanced from 6 to 10 cents a mile. The other theory is that government operation is hampered by the delays incident to government red-tape, but this announcement followed only eleven days after it had been recommended by a select committee of the Senate, which had investigated the affairs of the road during the recess of Congress, and did not even require a hearing before the Interstate Commerce Commission.

Perhaps, just as all signs are said to fail in dry weather, some theories do not work out in the cold climate of Alaska. Another explanation, however, may be found to lie in the fact that responsibility for this railroad lies somewhere between the Democrats and the Republicans, so that the usual criticisms by one party of the acts of the other do not get much of a rise.

The railroad was built under Democratic administration and has now cost some $70,000,000, part of which, however, overlapped into the later Republican administrations, that have also fallen heir to a succession of annual deficits, amounting in recent years to a total of about $10,000,000. Therefore both sides in Congress have been able to criticize each other to some extent but on the whole very little has been said on the subject.

Shortly before Congress adjourned last year, Senator Howell of Nebraska, nominally a Republican but also a Progressive with certain government ownership leanings, got himself appointed chairman of a select committee to investigate the affairs of the Alaska Railroad and report back to the Senate. It was understood that the committee would come back to the States with a report indicating that the fair cause of government operation had suffered somewhat at the hands of Republican management, Progressives having the advantage of being expected to throw bricks into almost any one's procession. The committee did report to the Senate on January 5 that the railroad has not always been the beneficiary of "that business efficiency which is inseparable from successful management" but it also recommended that its operation should be continued under a higher rate basis. It was possible to justify such a step even on a government railroad on the ground that the last change in its rates, a reduction made in an effort to stimulate traffic, had not succeeded and that the two privately-owned railroads in Alaska are charging much higher rates.

Possibly most of those who read the report, or the summary of it which was furnished by Senator Howell (published in the *Railway Age* of January 10, page 156), supposed that was the end of the matter, and that next summer Senator Howell would be investigating in some other part of the globe, but the committee devised an ingenious method for living up to the traditions of government ownership and keeping federal money in circulation in Alaska, even if the deficit is reduced.

The Interior Department appropriation bill as passed by the House had included an appropriation of $1,000,000 for the Alaska Railroad for the fiscal year 1932, of which $800,000 was to be available to meet the expected operating deficit and $200,000 for capital expenditures. Senator Howell's committee recommended that the bill be amended to allocate only $500,000 to deficit in operation, $250,000 for capital improvements, and $250,000 for continuation of an investigation of mineral and other resources in Alaska to ascertain the potential resources available which will affect railroad tonnage.

When the appropriation bill came up for discussion in the Senate on January 16 Senator Howell offered this as an amendment and it was adopted, after he had explained that the Secretary of the Interior had agreed to put into effect the rate increases recommended by the committee. So the government's appropriation for the railroad remains the same as before. The committee had also recommended that the train-mileage of the road be reduced approximately 100,000 miles, but the discussion failed to show what is to be done about this.

Senator King, of Utah, said he would prefer to vote to authorize the liquidation or sale of the railroad within two years. Senator Smoot said that if the railroad does not prove a success he would try to secure the passage of

legislation "that will put a bus and truck line into Alaska which can carry all the passengers and all the freight that will ever go over the railroad in any one year." This follows good Republican doctrine of the present day that railroads in difficulty by reason of lack of traffic should be "relieved" by building a highway or waterway alongside to "supplement" them, but Senator Kendrick, of Wyoming, a member of the Alaska investigating committee, said he had made inquiries and been convinced that the interest on the money required to convert the Alaska Railroad into a highway would amount to as much as the present deficit.

By unanimous consent Senator Howell's committee was authorized to continue to keep the Senate informed respecting the business of the railroad and the details of operation during the coming year.

Unit-Cylinder Tender-truck Clasp Brake

THE Unit Cylinder tender truck clasp brake, first applied to Canadian National Locomotive No. 5700, as described in the *Railway Age* issue of November 22, 1930, is being supplied exclusively by American Steel Foundries. It has all the distinguishing characteristics of the present standard tender-truck brake with the addition of the Unit Cylinder feature. Two small brake cylinders are applied at the inside ends of the truck frames. The cylinders actuate levers fulcrumed to the frame, and these levers, through the medium of pull rods, transfer the power to the main truck clasp brake.

The clasp brake, itself, comprises the usual system of double vertical levers which are connected by a horizontal lever to the brake cylinder mounted on each inside corner of the truck. As shown in the drawing, both clasp brake lever systems are connected to the same brake beams.

Heavy annealed copper pipe with heavy-duty fittings is rigidly attached to the truck frame and brought over to a point as close as possible to the center plate. A flexible metallic pipe is then used to connect this pipe to the main air brake pipe which is attached to the body of the tender. This permits the truck to swivel without a "break-in-two."

The Unit Cylinder brake has many distinct advantages over the present tender brake rigging, consisting of the truck brakes and the body brake, a few of the most outstanding of which will be mentioned.

The body brake is entirely eliminated, leaving that portion of the tender frame between the trucks clear for the application of stoker mechanism and other special equipment.

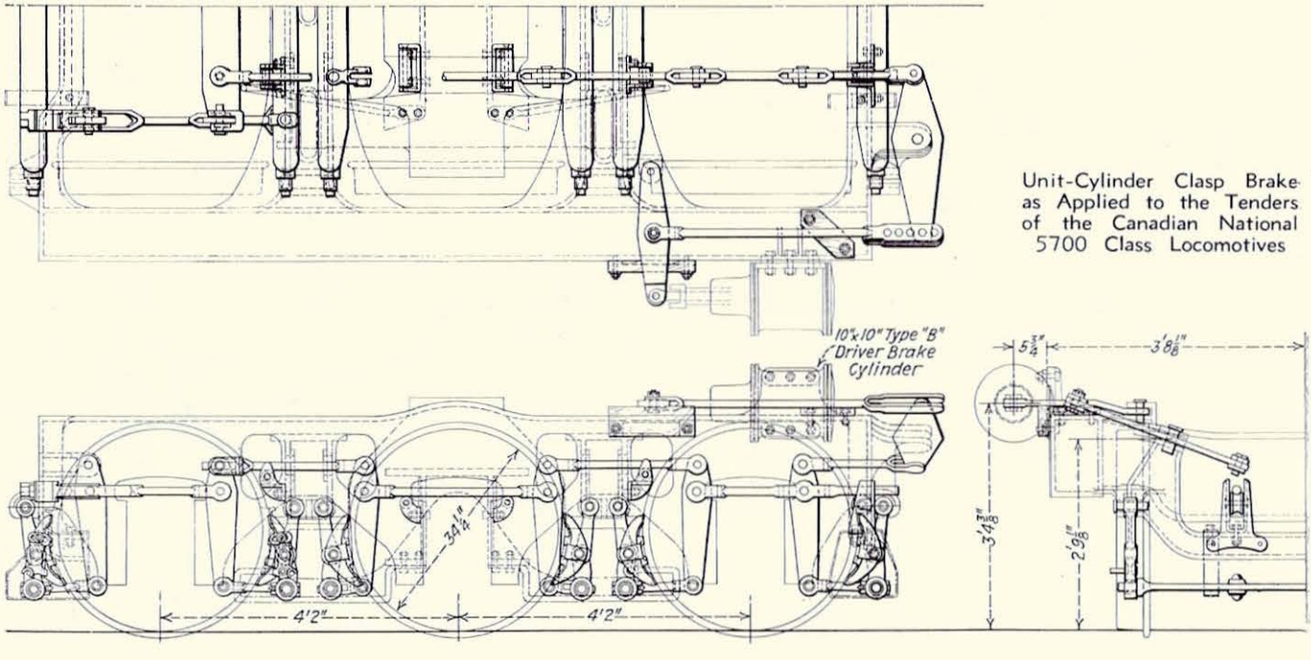
Trucks equipped with the Unit Cylinder brake can be interchanged as a unit under other tenders with longer or shorter king pin centers, inasmuch as no body brake connecting rods or others affecting body conditions need be considered.

Considerable lost motion in brake rigging is eliminated with the new brake arrangement, insuring a more rapid brake application and, as the result, shorter and easier stops.

On sharp curves there is a tendency toward twisting the truck levers on the usual truck and body brake application, because of the angular pull from the body brake which is supported from the tender frame. The Unit Cylinder brake is an independent truck unit and is not affected by curves, regardless of their degree.

With the Unit Cylinder brake, four 10-in. brake cylinders have sufficient power to brake practically any size of tender with a total ratio of 9 to 1, or under. The cylinders are easily accessible for packing renewal and more easily handled than the heavier and more bulky 16-in. or 18-in. cylinders generally used for body brakes.

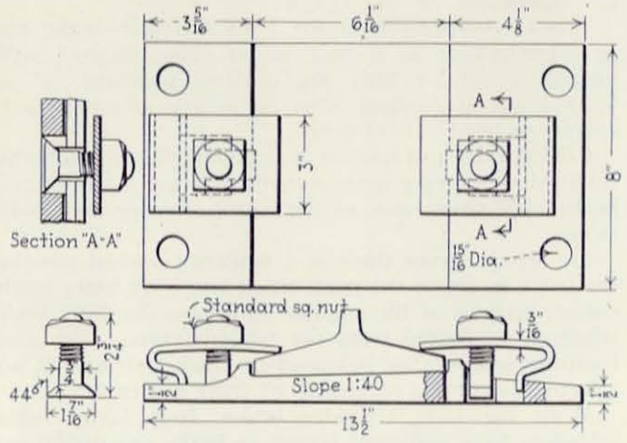
A Unit Cylinder brake has also been designed and built for application to six-wheel passenger-car trucks with an automatic slack adjuster used in conjunction with the cylinder arrangement. Here again the same advantages as on tenders are apparent, especially in the case of the elimination of all foundation brake rigging from the underside of the underframe, permitting the free use of this additional space for special equipment.



Unit-Cylinder Clasp Brake as Applied to the Tenders of the Canadian National 5700 Class Locomotives

Flexibility Provided in New Tie Plate Assembly

A NEW tie plate with special spring rail fasteners and several other features, designed to produce a stronger, safer and more economically maintained track structure, has been put on the market by the Q. & C. Company, New York City. This new assembly which has been in process of development on the D. & H. for the last four years, is now in use in two main line test installations on that road, totaling seven miles of track, and



Details of the M. & L. Tie Plate for Intermediate Ties as Used on the Delaware & Hudson

material has been ordered for a 65-mile installation to be made in 1931.

The new tie plate, which is called the M. & L. plate, consists of a double-shouldered tie plate with four round holes for lagging it to the tie and two special spring rail fasteners, which hold the rail to the tie plate by a bolt and nut assembly. The main features of the plate are its two rail shoulders, the four round lag screw holes, 1/16 in. of camber provided in the rail seat in line with the rail, and a specially punched T-shape slot through the shoulders, in each end of the plate, to receive the rail fasteners and the holding bolts. Within certain limits, the plate can be furnished in any size and with or without a canted seat.

The principal feature in the plate itself is the T-shape slot for holding the rail fasteners. These slots are located on the longitudinal center line of the plate, with the stems of the slots projecting toward the center of the plate. So designed, the slots receive the special rail fasteners and bolt assemblies, and have the additional feature that they can be used as cut spike holes in emergency.

The rail fasteners used with the plate were designed with two main thoughts in mind; to hold the rail securely in place and at the same time to permit flexibility in the track. In each case the fasteners consist of a section of ⅜-in. spring steel, three inches wide, bent into a shape resembling in section a flattened hook, having a broad curved top 4½ in. long, and an over-all depth of 1 11/16 in. A lip at the base of the fastener fits into the cross-bar of the T-shape slot in the plate, while the broad top of the fastener extends over the rail shoulder of the plate to a bearing on the base flange of the rail. The fastener is held in place by means of a ¾-inch bolt having a U. S. standard thread and a flat-sided, bevel-bottomed head, the special head being a counterpart to a special recess in the bottom of the plate, designed to keep the bolt from turning. In position, the threaded shank of the bolt projects up through the slot in the plate and through a hole punched centerly in the top of the spring fastener.

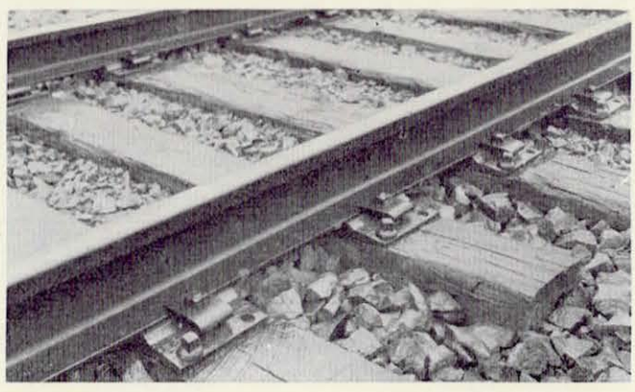
A square nut is used on the bolt, without a washer, and is turned down on the top face of the spring fastener sufficiently to put the proper holding force on the rail base. Two full turns of the nut after it comes in contact with the fastener are sufficient to put a gripping force of about 4,000 lb. on the rail.

Joint plates with this type of construction may be similar to intermediate plates, or increased in size to meet any type of rail joint arrangement used. The only fundamental requirement is that suitable space be available to punch the rail fastener slots.

The features in this new type of construction which are pointed out as giving strength and safety to the track are, primarily, the use of two rail shoulders, lagging the plates to the ties, and the use of the spring fasteners with holding power in excess of that obtained in the usual type of cut-spike construction. The claim of economy in maintenance is based on a number of features, including lagging of the plates securely to the ties; the provision of a rail fastener which precludes the necessity for spiking and respiking; and the provision of camber in the rail seat, in combination with the spring rail fasteners, which is intended to permit unrestrained wave motion in the rail without transmitting this motion to the ties. It is also claimed that the fasteners will prevent rail creeping and that they will permit rail renewal as fast or faster than where cut-spike construction is used.

The new tie plate construction is the result of four years of study and experiment on the D. & H., and is the direct outgrowth of tests of three other combination tie plate and rail fastenings. In both of the two present tests of M. & L. plates on this road, one of which is about six miles in length between Delanson and Kelleys, N. Y., and the other, about one mile long, near Smiths Basin, N. Y., the plates are used with 130-lb. R. E. rail, which is standard on the D. & H. In accordance with specifications of the road, the plates themselves are 13½ in. long by 8 in. wide, with flat bottoms, and have 1 in 40 canted rail seats and a maximum thickness of 29/32 in. under the seat. In common with the special features of the M. & L. plate design, the plates are double-shouldered, have 1/16 in. camber in the rail seats, and have four lag screw holes and two T-shape slots for the application of the spring rail fasteners.

Joint construction in the test sections is of the two-tie suspended type and consists of 4-hole Neafie joint bars, 18 in. long, and a 24-in. joint base plate, similar in section to the intermediate plates. The joint plates are punched with four rail-fastener slots, two on each side, 16½ in.



M. & L. Tie Plates in Track on the Delaware & Hudson

center to center, and four holes for lag screws, likewise two on each side. Neither of the two installations has been in service more than eight months but it is said that within this period both have stood up satisfactorily.

Tests on the D. & H. were planned and are being carried out under the direction of H. S. Clarke, engineer maintenance of way.

Express Agency Opposes Reduced Parcel Post Rates

WASHINGTON, D. C.

ANOTHER example of government competition with the railroads is pointed out by the Railway Express Agency, Inc., in a statement of objections filed with the Interstate Commerce Commission against the revision of parcel post rates proposed by the Postmaster General which he has asked the commission to approve. While several commercial and other organizations have been filing objections to the increased rates proposed by the Postmaster General the express company showed that although certain increases are proposed in the rates for the shorter hauls, which are already lower than the express rates, the readjustment includes still more reductions in rates for the longer hauls. Also the plan proposes an increase in the maximum dimensions of mailable parcels from 84 to 100 inches and an increase in the weight limit beyond the third zone, 300 miles, from 50 to 70 pounds.

The commission has since assigned the Postmaster General's application for hearing at Washington on February 19, although it had announced when it assigned the matter for investigation that objections could be filed with it up to January 15 and that the matter would then "stand submitted for decision."

The Railway Express Agency, the stock of which is owned by the railroads, points out that its interstate rates have been fixed by the commission while its intrastate rates have been either fixed or accepted by state commissions on the same basis, and, that, as the fourth-class mail matter is of the same kind and character as is transported by express, the government is a competitor of the express. It also asserts that the existing mail rates on packages moving in parcel post are generally lower than the express rates and that the department's deficit from parcel post could be made up by even larger increases for the short hauls than those proposed, without diverting business to the express.

"It is respectfully submitted," the express company says, "that any reduction in parcel post rates or increase in the dimensions or weight limit of parcel post packages, which result in taking from the express service traffic in addition to that which has already been taken from it by parcel post, tends to increase the cost of the handling and transportation of the matter left to that service, and may well jeopardize the very existence of the express service. There is a public demand for express service and the public interest requires that such service be not impaired nor its revenues depleted."

According to the Express Agency, the Postmaster General is proposing decreases in zones 6, 7 and 8 on packages weighing from 4 to 50 pounds, ranging from 1 to 47 cents, and his plan would result in increased rates in 40 per cent of the rates, decreases in 58.8 per cent of the rates and no change in 1.2 per cent. It is pointed out that the parcel post was inaugurated in 1913 with a weight limit of 11 pounds, but that this has been increased to 70 pounds in the first, second and third zones, while it is now proposed to increase it to 70 pounds in all zones. A substantial feature of the express service is the pick-up and delivery service, which necessitates a large number of vehicles and employees and the company contends that these should be utilized to the fullest extent possible in order to produce the greatest return on the investment, but the diversion of business from the express to the parcel post tends to raise the operating cost per shipment. An exhibit was attached giving comparisons of the rates from ten large representative cities to 47 destinations from which, the company says, it seems clear that there is not now and will not be under the proposed parcel post rates any competition in rates between parcel post and express in zones 1, 2, and 3, and that the proposed increases will not divert any parcels from parcel post to express. It adds that increases not more than 3 cents per parcel in these zones would produce enough additional revenue to wipe out the entire parcel post deficit of $15,570,730. The statement shows that the gross transportation revenue of the express company, which was $294,468,105 in 1921, had been reduced to $283,319,727 in 1929 and is estimated at $240,000,000 for 1930.

The Southeastern Express Company, operating on lines of the Southern Railway system, concurred in the statement.

I. C. C. Plans Inquiries Into Alleged Violations

(Continued from page 232)

proud of the position which it now occupies but that the number of cases should be reduced by perhaps four or five hundred cases more. There were 1,153 new complaints filed in 1930. Referring to the request of the commission for authority to delegate some of its work to individual commissioners or employees he said that the pressure of work on the commissioners "has just about reached the breaking point" and that they have to work all the hours they do not find necessary to spend in eating and sleeping. He gave the daily routine of a member of the commission, saying he gets to his office at 8 or perhaps 8:30 in the morning and leaves somewhere around 6 o'clock for dinner, but several come back regularly and others take their work home and it is a regular thing for them to work two or more Sundays every month.

The commission at the end of the year, he said, had 2,380 employees, after an increase of about 25 in the last year.

When one of the Congressmen asked Mr. McManamy about the status of the consolidation proposal he said that officially the commission knows nothing about it but that it has a communication from the railway executives saying that an application would be filed.

THE LEIPZIG SPRING TRADE FAIR, to be held this year from March 1-7, will comprise 10,000 exhibits, assembled from 22 countries, thus constituting the largest and most varied market in the world. An attendance of some 200,000 buyers is assured, including 30,000 from foreign countries. The United States will send more than 100 characteristic exhibits and upwards of 2,000 buyers, while a special American headquarters will be established and every facility offered for transacting business.

Motor Transport Section

Operating Motor Coaches and Trucks Saves Money

Central of Georgia effects substantial reductions in expenses by motor vehicle substitutions for trains

LIKE other railways, the Central of Georgia has suffered heavy losses in recent years in passenger revenue, and at the same time it has lost to the same type of competitor, the motor vehicle, a substantial volume of l.c.l. freight traffic. Passenger revenues, for example, have declined 49 per cent since 1920. Naturally, this loss of traffic has brought the passenger revenues of certain trains well below the train operating cost.

To meet this situation, the Central of Georgia, beginning in 1928, has embarked upon and steadily expanded a program of motor coach and truck operation in replacement of train service, its purpose being to provide its patrons with as good or better service than they received from the trains, while at the same time enabling the railway to reduce its operating expenses and thereby more nearly equalize the operating expenses and operating revenues on the unprofitable lines.

Operating Organization

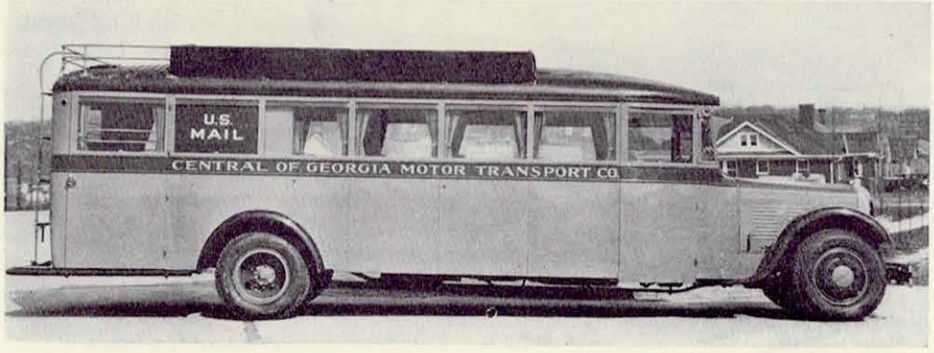
To carry on its highway operations, the railway organized a subsidiary, the Central of Georgia Motor Transport Company, in October, 1927. All of the officers of the subsidiary are likewise officers of the railway and receive no compensation from the former. Superintendents and other supervisory officers of the railway act for the motor transport company without extra compensation, and no portion of their salaries and expenses is charged to the subsidiary. All employees of the motor transport company, such as drivers, mechanics, etc., are, of course, paid directly by the subsidiary.

At the present time, motor coaches equipped to carry passengers, mail and express are operated on five routes, with an aggregate length of 167 miles. The longest of these routes is 60 miles in length and the shortest 13 miles in length. Motor trucks are operated on several routes in the Birmingham, Ala., district covering 85 miles of routes. To carry on its services, the motor transport company owns two Mack city-type, 15-passenger, combination motor coaches; one Mack city-type, 25-passenger motor coach; one Mack parlor-type, 29-passenger motor coach; one Yellow parlor-type, 29-passenger motor coach; two International 2½ ton trucks, and two White 2½ ton trucks. In addition, one International 1½ ton truck is rented by the motor transport company from the railway for freight service on the Tybee district.

The only motor coach operations of the company are substitutes for steam-train service, and are confined to the territories where authority for the change has been given by the state regulatory commission. None of the motor coach operations show a net income. On the other hand, the loss involved is substantially less than that entailed by the operation of steam trains, and the savings resulting from the motor coach operations are substantial in each case. The rate charged for transportation on the motor coaches is the same as the railway rate, and, except on two of the lines, rail service is continued by mixed trains.

Operating Conditions Difficult

Only one of the highways over which the motor transport company operates motor coaches is paved. The others are unpaved roads, but in spite of this fact continuous service has been maintained regardless of



One of the Train-Replacing Motor Coaches

Two of the Central of Georgia Trucks Operating in the Birmingham District

unfavorable weather or road conditions. If the condition of the road is such that a motor coach cannot be operated, service is maintained by the use of a touring car for passengers and, if necessary, a light truck for mail and express.

No Opposition from Patrons

The people in the territories affected by the substitution of motor coach service for train service for the most part interposed no objection to the change in the medium of transportation. In fact, in some instances the people insisted that the motor coach service be operated by the railroad instead of by individuals who proposed to operate motor coach lines over the affected routes. On two of the routes there is competition with motor coaches operated by independent companies, but these competitive operations are not local between the terminal points.

The first motor coach route established by the motor transport company was between Perry, Ga., and Fort Valley. One combination motor coach is used on this route, which has a capacity of 15 passengers and a separate express and mail compartment, 5 ft. by 6 ft. 6 in. by 6 ft. 4 in., which occupies the rear of the coach and is separated from the passenger compartment by a wall. The railway route mileage is 12.4 miles and the highway route mileage, 12.6 miles. Operating three round trips daily except Sunday and two round trips on Sunday, the motor coach mileage per year is 26,805 miles, compared to a train mileage of 25,866 miles. The motor coach has completely replaced branch line passenger service, the schedules being about the same. There being no passenger train service over this district, the motor coach takes care of all passengers, mail and express, and the motor coach serves all stations that were formerly served by the passenger train. The highway is not paved as yet and is bad in wet weather, but the work of hard-surfacing it will be completed shortly.

Mixed Train Continued

A 29-passenger motor coach has replaced the branch line train service between Opelika, Ala., and Roanoke. One round trip daily is operated over the 43-mile highway route, which is 15 miles longer than the railway route. The motor coach mileage per year is 31,390 miles, and the train mileage replaced, 28,324 miles. At the time the motor coach service was established, the railway was operating one passenger train each way daily and one mixed train each way daily except Sunday. The mixed train service is continued, the motor coach handling passengers, mail and light express. Here again the highway is unpaved and is bad in wet weather. All of the principal points are reached by motor coach which were formerly served by the train; in fact some of the settlements are closer to the highway than they are to the railway stations.

Another 29-passenger parlor-type motor coach is operated on the 60-mile route between Eufaula, Ala., and Ozark, making one round trip daily. The railway mileage is almost exactly the same, so that the motor coach mileage per year, which is 43,800, exceeds by only 73 miles the 43,727 passenger train miles which were eliminated. The railway is continuing the operatons of a mixed train service daily except Sunday over this route. All of the principal towns formerly served by the passenger trains are now served by motor coach. Those stations which cannot be reached by the motor coach are very small and the mixed train service is sufficient for their needs. The highway, as in the instances previously mentioned, is unpaved.

Another combination-type motor coach, with a 15-seat passenger compartment and a 6 ft. by 6 ft. 6 in. by 6 ft. 6 in. express and mail compartment at the rear, is operated over the 29-mile highway route between Cuthbert, Ga., and Fort Gaines. The railway mileage between these points is 22.6 miles. With one round trip daily by the motor coach, the annual motor coach mileage is 21,170, which is substantially greater than the annual train mileage of 16,498, which was eliminated.

Winter Service to Summer Resort

The only paved route over which the motor transport company operates a motor coach is that between Savannah, Ga., and Tybee, a distance by rail of 18 miles and by highway of 22 miles. A 25-passenger city-type motor coach makes 3 round trips daily and 2 round trips Sunday over this route, accumulating 3,916 motor coach miles each month as compared with the 2,848 train miles a month replaced. This service is operated only during the winter months and serves a seaside resort where the travel is very light during eight months of the year. The Georgia Public Service Commission granted permission for the withdrawal of steam train service during the winter months, but the railway expects to restore the train service, in part at least, about June 1, since during the three summer months the patronage of the trains on this line is greater than can be accommodated in one motor coach. The motor coach service may be discontinued entirely during the summer, or may be continued in substitution for part of the train service. During the winter months, when the motor coach replaces all regular train service, it is necessary to operate a motor truck on one round trip daily except Sunday to take care of the freight business. The freight formerly was handled on one of the passenger trains. Carload freight is handled on extra trains when necessary, which averages about once a week.

The motor coaches operated by the motor transport company have replaced 114,415 passenger train and mixed train miles per year, the motor coach miles ex-

ceeding the train miles by about 15,158 miles per year. It was testified at a recent Interstate Commerce Commission hearing, in connection with the investigation into the co-ordination of motor transportation, that the Central of Georgia is saving $7,038 a year from the replacement of passenger train service between Fort Valley and Perry; $10,004 a year from the replacement of passenger train service between Opelika and Roanoke; $6,758 from the replacement of train service between Eufaula and Ozark; and $4,135 a year from the replacement of passenger train service between Cuthbert and Fort Gaines.

Trucks Improve Service, Reduce Costs

After extensive study of the situation with respect to declining l.c.l. freight business, it was determined to speed up the service in order to hold the business remaining and to retrieve, if possible, at least some of that which had been lost. Truck operation was established on the Columbus division between Columbus, Ala., and Birmingham. Previously the railway had operated four local freight trains daily over this district, one each way between Columbus and Goodwater, and one each way between Goodwater and Birmingham.

With the establishment of truck service, the trains operated where reduced to two a day, one in each direction, running through between Columbus and Birmingham. Three concentration points were established, and one motor truck was assigned to each, these

Loading Express into a Combination-Type Motor Coach

concentration points being Opelika, Alexander City and Sylacauga. The truck located at each of these centers serves the stations within a radius of approximately 30 miles in each direction.

L.C.L. Freight Operations

The l.c.l. freight consigned to the local stations is loaded at the terminals, Columbus and Birmingham, into cars which are set off at the concentration points, where the loads are transferred to the trucks for delivery. Conversely, freight is collected by the trucks at the smaller stations and hauled to the concentration points for loading into merchandise cars for Columbus and Birmingham. The truck movements are from station to station only and store-door service is not offered.

Westbound freight is now delivered about two days earlier than formerly and eastbound freight one day earlier. This operation saves $20,000 a year in train operating expenses; although there is no saving in train miles, two crews and two engines are released by running the local freights through from Columbus to Birmingham. In addition, the annual saving in per diem on freight cars is estimated at nearly $12,000.

Motor Transport Hearing at St. Paul

THE Interstate Commerce Commission investigation in Docket 23,400, Co-ordination of Motor Transportation, was continued with a two-day hearing at St. Paul, Minn., which began on January 12. Examiner Leo J. Flynn presided and was assisted by Examiner Albert E. Stephan.

Regulation of interstate motor coach and truck operation was strongly favored by railway witnesses in their testimony. The commission was told that the northwestern roads are suffering from motor vehicle competition and while they are attempting on their own part to find means of meeting this competition, they are depending upon the government for appropriate legislation to put the railways and their competitors upon a more nearly equal footing with respect to regulatory supervision.

A. M. Fenton, vice president in charge of traffic of the Chicago, St. Paul, Minneapolis & Omaha, was the first witness. Mr. Fenton offered a statement outlining the kind of regulation of interstate motor vehicle operations which the railways would like to see put into effect. Under present conditions, he testified, trucking companies, particularly the contract carriers, are paralleling and duplicating railway freight facilities, juggling their rates as they please, discriminating between different shippers as to the rates charged, and resorting to any expedient necessary to secure traffic.

The railways are giving serious consideration to the provision of store-door collection and delivery service, hoping thereby to recover some of the merchandise traffic which is now moving by motor truck. He said that railways should be permitted to remove unprofitable trains and to substitute motor coach or truck service for them, either directly or by arrangement with independent motor coach or truck operating companies.

Regulation of motor carriers, Mr. Fenton said, should include the following: Regulatory provisions similar to those now controlling the activities of the railways; means of preventing "contract" carriers from engaging in common carrier operations under the guise of contract hauling; the requirement of certificates of convenience and necessity as a pre-requisite to common carrier operation, and some form of permit as a pre-requisite to contract operation; the requirement that common carrier motor coaches and trucks should publish and adhere to, non-discriminatory rates, and that contract carriers do the same; the requirement that the rates of motor carriers be sufficient to make the business pay its way, thus eliminating the competition of irresponsible and short-lived operators who injure legitimate, permanent and responsible carriers; and regulation as to insurance, hours of service of employees, accounting systems and the issuance of securities. Mr. Fenton also said that regulation of the railways should be relaxed sufficiently to permit them greater initiative in meeting competitive conditions as they arise, without, of course, permitting rebating or discriminatory practices.

The next witness, Carl R. Gray, Jr., vice president and general manager of the Omaha, said that he did not believe the truck lines should be permitted to operate in direct competition with railways when the service performed by the latter is adequate and reasonable. He said that the truck is a means of supplying speed

(Continued on page 251)

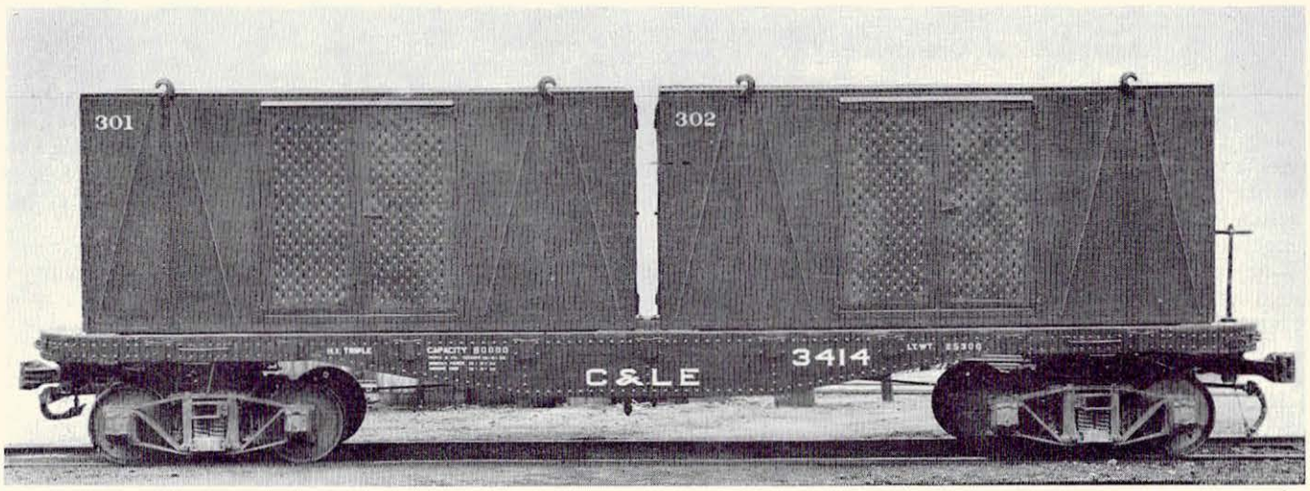
Containers Used in Co-ordinated Freight Service

Trucks give store-door service for shipments routed by rail between Cincinnati and Toledo

As a means of reducing long distance trucking over the highways and of co-ordinating railway and highway service, a group of trucking companies in Ohio have organized Cargo Transport, Inc., as a forwarding company using containers for the movement of freight over the lines of the Cincinnati & Lake Erie, between Cincinnati, Ohio, and Toledo. The Motor Terminals Company, Cincinnati, which for a number of years has handled the interchange of l.c.l. freight between railways in Cincinnati in a container-motor truck service, was the leading factor in the organization of Cargo Transport, Inc.

The operation is relatively simple. Cargo Transport leases from the Motor Terminals Company containers which can be carried on trucks as motor truck bodies, and also craneways and cranes which have been erected at Cincinnati and Toledo. These are used for lifting the containers off the trucks and on to the flat cars of the railway, or vice versa. Under a tariff filed with the Public Utilities Commission of Ohio by the Cincinnati & Lake Erie, the railway moves the containers of Cargo Transport under a minimum tariff of 30 cents per car mile. Under a contract between the Cincinnati & Lake Erie and the Motor Terminals Company, whose special gantry cranes are used, the railway pays the Motor Terminals Company 25 cents per lift for the use of the cranes in interchanging the containers between the flat cars and trucks. The only terminal expense to the railway is that involved in the spot and pull service in moving the cars to and from the gantry cranes at each end of the rail haul, plus 50 cents for loading two bodies at the point of origin, and 50 cents more for unloading the two bodies at destination, making a total terminal expense, aside from the switching movements, of $1 per car.

The motor truck organizations who participate in the operations of Cargo Transport carry out the pick-up and delivery service in one of two ways. If the shipments of one company are of substantial volume, a container is furnished to the shipper for direct loading. Upon completion of the loading of the container, it is moved by truck to the railway station for transfer by crane to a flat car. When the loadings from one shipper do not warrant an individual container, freight is collected by small, light-duty trucks, taken to the truck terminal where the shipments are stowed into a container, the container then being moved by a heavier truck to the railway station for loading on a flat car. These operations are reversed at the point of destination. Upon completion of the body loading, a seal is placed on each of the four doors of the container before it is delivered to the railway.

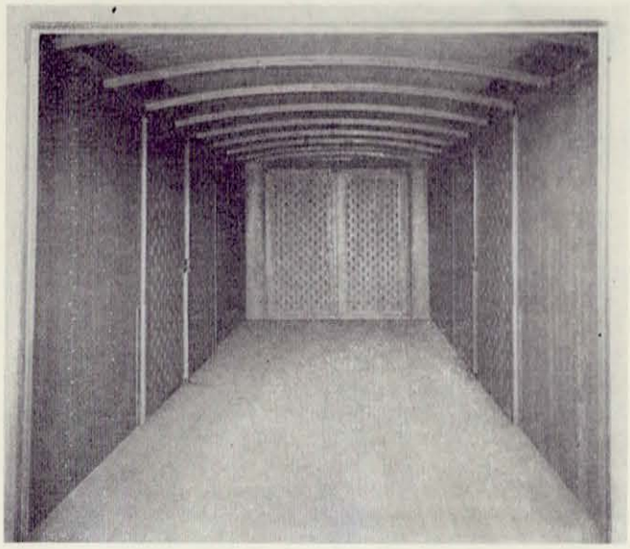


Truck-Body Containers Mounted on a C. & L. E. Flat Car

The truck body containers are 17 ft. 6 in. long, 8 ft. wide, and 7 ft. 6 in. high. The flat cars of the railway have been equipped with special anchorage devices for centering and firmly holding the containers. When a container is lowered by the crane to a flat car, these anchorage devices automatically lock all four doors of the container so that pilferage is impossible. Under the railway tariff, Cargo Transport is responsible for all loss and damage claims except in case of damage to the container and its contents through a wreck or avoidable abuse while the container is in the custody of the railway.

Over-night freight service is rendered under this plan between Toledo and Cincinnati, and second-morning delivery is given to Michigan and Kentucky cities. All container loads are covered by insurance on a basis of $20,000 per load.

The rates charged by Cargo Transport compare



Interior of the Truck-Body Container

favorably with the railroad freight rates, eliminating the cartage charges at origin and destination, so that the operation generally consists of store door delivery and pick-up service at railroad rates.

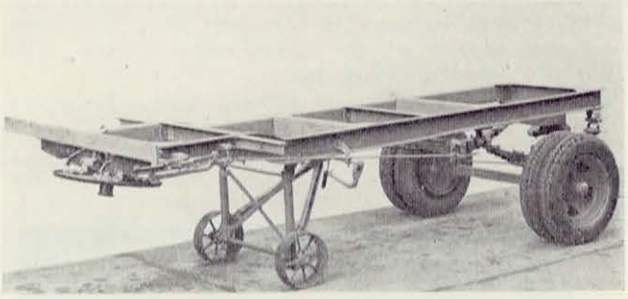
Advantages of Operation

Numerous advantages are claimed for this type of operation. First of all, it combines the respective advantages of motor truck service and railway service under a co-ordinated system of operation. The railroad benefits from the fact that the service is sufficiently attractive to bring back to it traffic which had been lost to competitive truck lines. At the same time the railway is able to handle the shipments under a favorable car-mile revenue with the virtual elimination of the heavy terminal expense involved in handling l.c.l. freight. The mechanical interchange of containers between trucks and flat cars reduces the re-handling of freight. The hazards of inter-city truck operation and the possibility of delays due to highway congestion are eliminated. It is expected that the service will prove substantially more dependable than inter-city trucking service. Loss and damage will be reduced, if not eliminated, because of the fewer handling of shipments and because of the automatic locking features embodied in the truck body containers.

Lapeer-Trailmobile Offer Light Semi-Trailer

A 3-5 ton semi-trailer, offered in both automatic and manual types, and which, with a 1½ ton tractor, puts the equipment in the 2-3 ton truck class, has been placed on the market by the Lapeer Trailer Corporation and the Trailmobile Company, Cincinnati, Ohio. Known as the Dispatch semi-trailer, this equipment is the lightest ever produced by these companies.

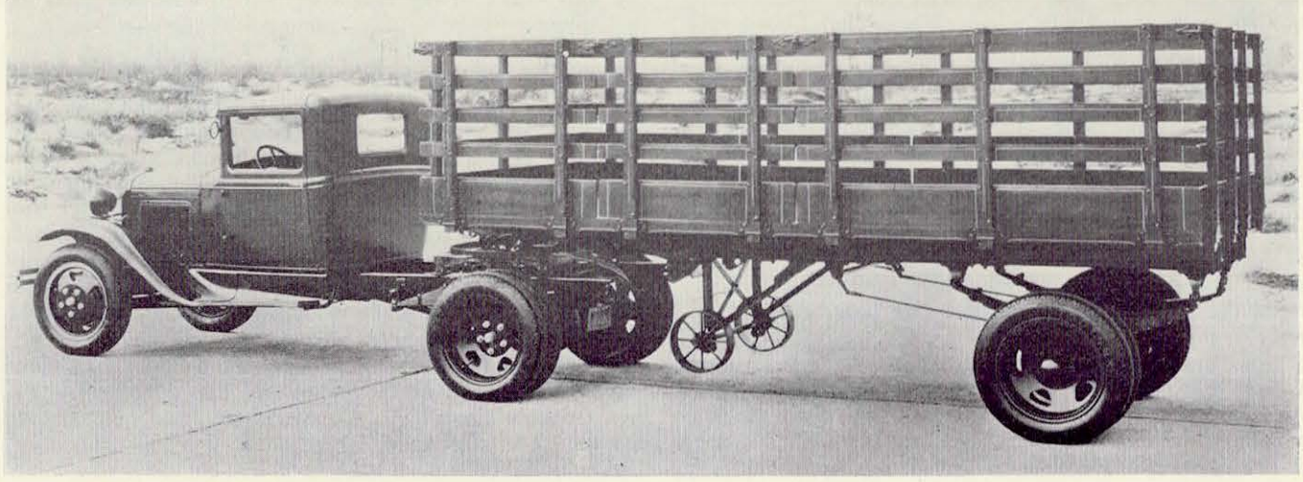
The Lapeer automatic Dispatch semi-trailer has overriding brakes which control the speed of the trailer; rollers with a wide surface on the upper fifth wheel, which facilitates coupling; full cab control, which permits coupling and uncoupling from the cab; and an improved support leg which insures the stability of the front end of the tractor when it is uncoupled, regardless



The Trailmobile Manual Dispatch Chassis

of the load condition or the ground level. The Trailmobile manual type is featured by angular coupling, with a 28 in. upper fifth wheel, providing liberal bearing surface and making possible coupling at considerable angles; a parking brake lever located on the side of the trailer near the front; and, when desired, power controlled braking equipment.

The trailer has a pressed steel frame with 6 in. rails reinforced by 2½ in. flanges. The rails are 6½ in. deep beneath the center of the load, and pressed steel cross members with integral gusset plates provide for rigidity of the frame. A 3 in. drop in the frame lowers the loading height, and coupling members are below the floor line, providing additional floor space forward.



The Lapeer Automatic Dispatch Semi-Trailer

The oversize axles are fitted with Timken roller bearings. The brakes are of the internal expanding type, 16 in. by 3 in., and are fully enclosed. Alemite lubrication is used throughout, and Budd dual wheels are standard.

The average weight of the chassis with brakes is 2,200 lbs.; the length, 15 ft.; the width, 40 in.; the height, on 30 in. by 5 in. tires, 42 in.; and the tread, 61½ in.

Motor Transport Hearing

(Continued from page 248)

in transportation to those localities which are not served directly by railroads or which are served inadequately. Trucks, according to Mr. Gray, should be used as feeders to the railways. He said also that under certain conditions trucks can replace freight trains, and can take the place of short railway extensions.

Mr. Gray described the trucking operations of the Omaha, which owns the Wilson Transportation Company operating a number of truck lines out of Sioux Falls, S. D. He said that this experiment in truck operation has proved successful, but added that the conditions surrounding the operation, are unusually favorable. The earnings of the truck company approximately equaled its expenses during the year 1930, but the operation of trucks has substantially increased the carload traffic of the Omaha into Sioux Falls.

E. L. Pardee, passenger traffic manager of the Omaha, described the reduced passenger traffic of the railway, and mentioned the rate-cutting activities of the motor coach lines competing with the Omaha. The railway operated 17.3 per cent less passenger train mileage in 1930 than in 1929, Mr. Pardee said.

L. R. Capron, freight traffic manager of the Northern Pacific, was the first witness for that railway. Mr. Capron said that between Seattle, Wash., and Portland, Ore., the Northern Pacific has been successful in meeting motor truck competition. This has been accomplished by means of low rates allowed on large quantities of freight. The local trucking firms Mr. Capron said, assemble many individual shipments into consolidated carloads, and these are handled by the railway. Examiner Flynn asked Mr. Capron if a similar system would be successful, for example, between the Twin Cities and Fargo. Mr. Capron replied that the freight department of the Northern Pacific wanted to try the experiment in the Twin Cities territory, but that the legal department had found that the legal obstacles were practicably insurmountable. Mr. Capron said that it will be impossible for the Northern Pacific to meet truck competition in Minnesota until the interstate truck lines are subject to regulation.

E. G. Clark, freight traffic manager of the Minneapolis, St. Paul & Sault Ste. Marie, expressed the view that all motor vehicles using the highways on a "for-hire" basis should be subject to regulation. He also urged uniformity of state and federal regulation applying to the intrastate and interstate lines respectively.

H. R. Carl, assistant general freight agent of the Great Northern, testified that by speeding up its freight train service and carrying on an active campaign for business, the Great Northern in several instances has been successful in meeting the competition of common-carrier motor trucks, in cases where the rates charged are approximately equal. He said that the Great Northern is planning further improvements in its freight service, and that the company is making a study of store-door collection and delivery without having reached any decision concerning it as yet. The lines between the Twin Cities and St. Cloud and between the Twin Cities and Willmar were mentioned by Mr. Carl as among those now enjoying a larger freight traffic as a result of the faster service offered. Shippers, he said, prefer the railway service to that offered by common carrier trucks, which are operating under state regulation.

W. K. Adams, general passenger agent of the Minneapolis & St. Louis, testified to the substantial losses of passenger traffic by that road in recent years.

L. E. Luth, director of the traffic bureau of the Winona, Minn., Chamber of Commerce, testified that replies to a questionnaire sent by him to Winona business men showed that most of them were in favor of more comprehensive regulation of the motor carriers. He added that 85 per cent of those replying to the questionnaire said they recognized a need for federal regulation of the interstate lines.

Contrary to expectations, there was no testimony by representatives of motor coach or motor truck lines, and the hearing at St. Paul adjourned on January 13 to be continued at Seattle, Washington, on January 19.

* * * *

Union Motor Coach Station at Salt Lake City, Utah, Used by Interstate Transit Lines

Communications and Books . . .

Says Motorists, Not Buses, Pay Less than Share of Road Cost

MARION, ILL.

TO THE EDITOR:

I note, with interest, your editorial comments (*Railway Age*, December 27) on my letter relative to the rail-highway competition, and your comment on the fact that I do not say anything about the discriminatory tax application.

There has already been too much said about this, all of which has not been based upon the facts; I should say all that was said prior to the Interstate Commerce Commission hearing in Docket 23400, where it was necessary to speak under oath, when it was a different question.

One of the Class I railroads put in the record, Exhibit 125, showing that the ratio of taxes to revenue on their railroad, 1916 to 1930, was 6.85 per cent; the same railroad was operating buses and in the same exhibit showed that the ratio of taxes to revenue on their bus operation was 11.53 per cent in 1929, and 13.01 per cent in 1930. In every instance the railroad witnesses stated that the taxes were not proper on the buses and trucks just as you have claimed all along, but on cross-examination, not a single one of them could give any information to that effect, nearly all of them admitting that they did not know anything about the highway taxes except the case cited where they did know it was much higher than the rail, and the proper picture would be given to this if it were put on a passenger-revenue-mile, or freight-ton-mile basis, which would also show it much more in favor of the statement that it is already much higher, and, in fact, too high on the buses and trucks and especially if it were based on the users' portion of the load based on weight and the space occupied as compared with the other vehicles, which is principally the private automobile. In fact, it is now 33.2 per cent higher than its equal portion based on weight and space occupied on the road.

Since the Transportation Act of 1920 virtually guaranteed rates high enough to justify a fair return on the investment and it has now been proven that the railroads' gross and net is being very seriously affected by the sole question of the rates being too high, the railroads should be the first ones to advocate lower taxes on buses and trucks, and it is not only going to be desirable, but absolutely necessary on their part to comply with the shipping public's desire and demand that the transportation system be speeded up and made complete and the missing link (door-to-door pick-up and delivery) eliminated.

The railroads, except for carload shipments where industrial tracks are provided, never have given a complete transportation service, but only station to station, and the shippers have always felt that they were not in the transportation business and it was necessary to demand fleets of trucks to haul their goods to and from the station that would haul it to the customer's door, in order to effect quicker delivery, giving them a better service and save money themselves. Sad as it might seem, there is no possible way whereby the law of economics can be defeated as the highways develop. To attempt to do so by destructive taxation, will not only increase the competition, but will further aggravate the public and Congress against the unwarranted and unjustifiable attack.

Wouldn't it have been absolutely silly for the canals or stage coaches to have attempted to place a tax upon the railroads high enough to make it impossible for the railroads to compete with them? The present situation is exactly the same only on the other foot. The present age finds quantity production in everything except the railroads, and even there so far as greater tonnage can be moved by larger locomotives; but there it ends, and there is no land form of transportation which can perform at as low a cost per passenger mile, or freight ton mile as can the railroads, if they wanted to. In quantities of 80 passengers, or more, between the more distant points, the railroads can give a better service at only .000 cent per mile, while the lowest possible cost the passengers can be handled for on the highway is one cent per mile, and freight can be handled, both carload and l.c.l., at less than one-eighth of the cost of handling it by truck, but the fact that the railroads prefer a high rate and low quantity to a little lower rate and high quantity, has resulted in the present chaotic condition. The same is true in the automobile manufacturing business, or any other business of this age. Some of our cheapest automobiles have resulted in the greatest profit to the manufacturer, which is more in the nature of a unit cost than is transportation, for the reason that it costs just as much to run a train with low ton miles as when loaded to capacity, and this applies both in passenger and freight, but what is more important even than the cost, is service; hence the old proverb, "He who serves best, serves most."

If the railroads depend upon the provisions of the Transportation Act, that the Interstate Commerce Commission shall keep the rates high enough to justify a fair return on the investment, they will be lost, as the higher the rates on the railroad, the more traffic will be diverted to the highway; hence, for the first time in history the railroads, as well as every other industry, has competition. We say, "Competition is the Life of Trade," and it would be the life of the railroads if they would heed to cut out the gross waste now being performed in an attempt to give the service by a steam train where the bus or truck is the proper vehicle, and adjust the rates so that the steam train can get all of the business where it is the proper vehicle, and last, but not least, render the service between the store door and the stations so that it is not necessary for shippers to maintain a fleet of trucks for this purpose, by reason of their existence, perform the whole service at a lower cost than this service plus the railroad rate.

H. E. BARBER,
President, Egyptian Transportation System.

[Mr. Barber's contentions on the subject of taxation of commercial users of the highways are answered in an editorial appearing elsewhere in this issue.—THE EDITOR.]

New Book

Henry Villard and the Railways of the Northwest, by James Blaine Hedges. 224 pages, 9 in. by 5¾ in. Illustrated with maps. Bound in cloth. Published by the Yale University Press, New Haven, Conn. Price $3.

The author, who is professor of American history in Clark University, hopes in the present volume to have fulfilled "in some measure" the wish expressed in the preface to the Memoirs of Henry Villard, published in 1905, that "a detailed exhibition of his relations to the development of the far Northwestern states may some day find its way into print." That Prof. Hedges has satisfied this wish in full measure will be realized from a reading of this volume which is a dispassionate marshalling of facts gleaned from a logical analysis and arrangement of "the record." The reader may trace the original rise of Villard to power in Northwest transportation circles, his fall in 1884 and his come-back some three years later to remain an influence until the failure of the Northern Pacific in 1893 brought his railroad career to an abrupt ending.

Villard first entered the transportation field in the Northwest as agent for German bondholders of the Oregon & California. Here his role of conciliator commenced when he succeeded in harmonizing relations between the Oregon & California and its potential competitors, the Oregon Central and the Oregon Steamship Company. New competition, nevertheless, arose to depress the spirits of the European security holders and in 1879 Villard was prevailed upon to form a syndicate to purchase their holdings. He thus became involved not only as a representative of outside interests, but also as an actual security holder.

Villard's role as outlined in the foregoing remained substantially the same throughout his career in the Northwest; always the conciliator of transport interests which threatened to be-

come mutually destructive he later exercised his influence in a larger field when he obtained a voice in councils of the Northern Pacific, the Oregon Railway & Navigation Company and the Union Pacific. Especially does the author find Villard's policy of conciliation a factor in the period following his reappearance in Northwest railway affairs in 1887. "Probably no railway promoter in the Pacific Northwest ever strove so earnestly for the good of all as did Villard, from 1887 to 1889," he says.

The book presents also an interesting account of the struggle for supremacy between Portland and cities on Puget sound and the efforts of the railways to monopolize the trade of the "Inland Empire" in which latter connection "millions of dollars were expended in premature building until competitive construction was brought to a halt by the financial collapse of both the Union and Northern Pacific, and the disputed areas were crisscrossed with grass-covered railway tracks"

Books and Articles of Special Interest to Railroaders

(Compiled by Elizabeth Cullen, Reference Librarian, Bureau of Railway Economics, Washington, D. C.)

Books and Pamphlets

The Changing Transportation Situation, by Ralph Budd. "... The significance of the development of these other forms of transportation is that, while they represent progress, they have changed the competitive position of the railways, and this change must not be lost sight of in considering the public's attitude toward the railways. This is true because the railways continue and will continue to be absolutely essential... The problem of coordinating railway and other transportation is not peculiar to the United States... Neither is the misfortune of poor earnings peculiar to the railways, indeed the railways merely reflect the poor business of others..." p. 12, 14. 15 p. Pub. by Great Northern Railway Co., St. Paul, Minn. *Apply.*

The Coming of Industry to the South, edited by William J. Carson. Compilation of articles on southern industry and industrial resources, industrial development in Virginia, North Carolina, Tennessee, and Alabama, labor and labor problems, and problems of economic and social adjustment to industrial changes. "Transportation developments and economic and industrial changes," by Roland B. Eutsler, p. 202-209. 296 p. Pub. by American Academy of Political and Social Science, Philadelphia, Penna., as its *Annals,* January, 1931. $2.

Industrial Traffic Management—A Survey of its Relations to Business, by Wayne E. Butterbaugh. Made by Department of Commerce at request of Associated Traffic Clubs of America and based on data secured through questionnaire. Issued as Domestic Commerce Series No. 39. 172 p. Pub. by U. S. Govt. Print. Off., Washington, D. C. 30 cents.

Periodical Articles

Air Services in Europe, Africa and Australia, by Lawrence E. Ring. "The services in actual operation during the year just closed covered 72,084 miles of airways in Europe, 3,769 miles in Africa, and 9,458 miles in Australia, as compared with 49,425 miles in the United States." p. 131. Maps, inside front cover (Europe), p. 131 (Africa), and p. 132 (Australia). Commerce Reports, January 19, 1931, p. 131-132.

Future Trends in American Transportation. Yale Daily News, January 5, 1931. Reprinted in Congressional Record, January 15, 1931, p. 2346-2347.

Labor Legislation of 1930. Part I is analysis by subjects and by states. Part II is topical index by states. American Labor Legislation Review, December, 1930, p. 461-474.

Sectional Airway Maps of the United States. Description of maps prepared by Department of Commerce, prices, sections covered, etc. Air Commerce Bulletin, January 15, 1931, p. 357-362.

That Acid Test—The Ledger—Indicates Success, by Otto S. Beyer. Results of union-management co-operation on railroads during depression. Journal of Electrical Workers and Operators, December, 1930, p. 667-669.

GENEVA COLLEGE

Looking Backward . . .

Fifty Years Ago

The stockholders have ratified the consolidation of the Buffalo, Pittsburgh & Western and the Salamanca, Bradford & Allegheny with the Pittsburgh, Titusville & Buffalo and the Titusville & Oil City into a new company to be known as the Buffalo, Pittsburgh & Western [now part of the Pennsylvania]. The bonded indebtedness of the new company will be about $21,000 per mile. It will extend from Brocton, N. Y., on Lake Erie, to Oil City, Pa., and from Oil City to Salamanca, N. Y., with a branch to Bradford, Pa. With the proposed line from Brocton to Buffalo, the new company will have about 295 miles of line.—*Railway Age,* January 27, 1881.

The reformation of the evils growing out of the ticket commission system and other kindred abuses has fairly begun, and gives promise of complete success. Significant evidence of progress is seen in a circular dated January 18 from the general passenger agents of the Atchison, Topeka & Santa Fe, the Union Pacific and the Denver & Rio Grande [now the Denver & Rio Grande Western], notifying all agents that after February 1 the payment of all commissions over their respective lines to points west of Kansas and Nebraska, except Montana, the Black Hills and local points in New Mexico, will be discontinued.—*Railway Age,* January 27, 1881.

Twenty-Five Years Ago

Richard H. Aishton, heretofore assistant general manager of the Chicago & North Western, has been appointed general manager, with headquarters at Chicago.—*Railway Age,* January 26, 1906.

The post office department has made arrangements for a new fast mail service through Indian Territory [now Oklahoma] and Texas. The plan covers a changed service over about 1,000 miles of railroad, with an improvement in the time of mail to Wagoner, I. T., Muskogee, South McAlester and Durant, Denison, Tex., Sherman, Corsicana, Ennis, Hearne, Mexia, Houston, Fort Worth, Waco, Temple, Austin and San Antonio from St. Louis and the East of from 10 to 12 hours. The route includes 78 miles over the St. Louis & San Francisco from Monett, Mo., to Vinita, I. T.; 275 miles from Parsons, Kan., to Denison, and 258 miles from Denison to Taylor, Tex., over the Missouri, Kansas & Texas, and 389 miles over the Houston & Texas Central [now part of the Southern Pacific] from Denison to Galveston. At Denison the mails will be divided, a portion continuing over the Katy to San Antonio and the remainder to Galveston over the Houston & Texas Central. Connections out of San Antonio and Fort Worth into Western Texas will make the saving in time in many places as much as 24 hours.—*Railway and Engineering Review,* January 27, 1906.

Ten Years Ago

C. T. O'Neal has been appointed an assistant to the staff officer of the United States Railroad Administration handling the settlement of claims arising out of Federal control of the railroads. His headquarters will be at Washington, D. C.—*Railway Age,* January 21, 1921.

The management of the Pennsylvania on December 29 concluded with the representatives of its engine and train service employees a mutual working agreement, regarding the settlement of future labor differences, which, it is expected, will climinate any question of strikes on that road, so far as train operation is concerned. As a medium of carrying out the purposes of peaceful settlement, a joint reviewing committee has been established for the settlement of all controversial questions. The employees involved will, for the first time in the history of the Pennsylvania, have equal voice and vote with the management as the committee will constitute a court of review involving grievances, rules and working conditions.—*Railway Age,* January 21, 1921.

Odds and Ends . . .

The Black Watch

When the London, Midland & Scottish decided to name one of its locomotives "The Black Watch," the officers of that famous regiment agreed that the engine should bear the regimental crest. Accordingly, at a military ceremony in Glasgow, plaques, presented by the regiment and bearing its name, were affixed to the locomotive.

Those Baseball Stations

LITTLE ROCK, ARK.

TO THE EDITOR:

In connection with the item appearing in the *Railway Age* of September 27, entitled "Comiskey Honored" I must plead guilty on both counts, being a baseball fan and having named the said stations. At the time the line was built I was chief rate clerk in the passenger department of the Missouri Pacific. I did not dream, however, when I made these footprints on the sands of time, that the *Railway Age* would photograph them many years later.

H. L. DENIS,
Pensioned Chief Clerk,
Passenger Department, Chicago, Rock Island & Pacific.

Times Have Changed

NEW YORK.

TO THE EDITOR:

By the way of contrast to the comfortable traveling facilities which are now universal on the modern railroad, it is interesting to read—as reported by the Jersey Central News—a copy of the rules for travelers on the first railway of England, the Liverpool & Manchester, a document still preserved among the archives. The centenary of this railroad was observed in England early this spring.

"(1) Any person desiring to travel from Liverpool to Manchester, or vice versa, or any portion of the journey thereof, must, twenty-four hours beforehand, make application to the station agent at the place of departure, giving his name, address, place of birth, age, occupation, and reason for desiring to travel.

"(2) The station agent, upon assuring himself that the applicant desires to travel for a just and lawful cause, shall thereupon issue a ticket to the applicant, who shall travel by the train named thereon.

"(3) Trains will start at their point of departure as near schedule time as possible, but the company does not guarantee when they will reach their destination.

"(4) Trains not reaching their destination before dark will put up at one of the several stopping places along the route for the night and passengers must pay, and provide for, their own lodging during the night.

"(5) Luggage will be carried on the roof of the carriages. If such luggage gets wet, the company will not be responsible for any loss attached thereto."

LEW R. PALMER,
Conservation Engineer,
The Equitable Life Assurance Society.

Pacific 4-6-2

The steam locomotive is, when all is said that can be said for other devices, about the most dramatic expression of hand and mind co-operation. It is a magnificent piece of craftsmanship. It is the noblest of articulated tools. It fills the whole demand of the imagination as a thing to ride on across the country. A horse is a great and mysterious thing and Job did not overdraw the picture of him, his neck clothed with thunder, pawing in the valley, the glory of his nostrils terrible. But this beast which stands here in the rain-streaked night on its 4-6-2 chassis, weighing 360,000 lb., this amazing simulacrum of life, breathing gently with its duplex air pumps, humming slightly at the safety valve, gleaming faintly on its polished sinews, a huge demonic figure condensed from the darkness, a djinni of the Arabian Nights tied to a string of 14 cars which it is prepared to drag in a furious rush to New Haven en route to New York and Washington—this beast, I say, is the most expressive symbol of the courage and craftsmanship of man since the clipper-ship era.—Atlantic Monthly.

Simple Time Tables

Nearly every one who has struggled with railroad time tables has found them confusing. After the desired train has been carefully pursued across thickly figured pages, a sinister asterisk or dagger warns the would-be passenger that the Cannonball does not run on Sunday, or else passes disdainfully by his station. In London an aid in the form of a huge book time table is being tried out a Charing Cross Station. The volume has pages two feet by four feet, made of metal, the leaves are marked not by numbers, but by the hour of the day. Turning to the time when he wishes to depart, the traveler finds listed the stations at which his train stops, the hour of leaving, the name of the train and the platform number. The books are prominently displayed in the middle of the station, and are illuminated by floodlights at night. Special books are used for week-day, week-end and Sunday trains. The London Morning Post reports that the plan is meeting with popular approval, while the information desk is spared hundreds of inquiries. The books are so convenient for the homeward bound, looking hurriedly for the next train out, that duplicates will probably have to be provided for the forehanded who seek to use them for general reference.

* * *

Miss Isabelle Lawry, Operator for the Great Northern at Armington, Mont., and a Specimen of Her Handwriting that Won First Prize in a Recent Telegraphers' Penmanship Contest

NEWS

B. & O. To Equip Train for Air Conditioning

Device will be installed on cars of "Columbian," New York-Washington train

The York Ice Machinery Corporation, of York, Pa., has received an order from the Baltimore & Ohio to equip with air conditioning machinery all coaches used on the B. & O.'s "Columbian," operating between Washington, D. C., and New York. The order covers diners, club, observation and chair cars.

The equipment to be installed has been designed jointly by Baltimore & Ohio engineers and the engineering department of the York Company after extensive experimenting and will supersede the style of ventilation now in use. It will permit of ventilation of the coaches at controlled temperatures without admission of smoke or dust.

Each coach will be equipped with a complete air conditioning unit electrically powered, thus providing constant operation whether the car is in motion or standing. The equipment is designed to give a complete change of fresh air in each coach every two minutes at any desired temperature and will make unnecessary opening of windows in summer months or any other period of the year. Air admitted when doors are opened is immediately taken up by the system and passed through the conditioning process.

Complete Electric Schedules on D., L. & W. Ready January 25

The last of five sections—from Morristown to Dover—of the Northern New Jersey suburban electrification project of the Delaware, Lackawanna & Western will be placed in operation on Thursday, January 22. The first passenger-carrying electric train to be operated over this section has been chartered by the Dover Chamber of Commerce. Regular electric operation will be begun immediately during the non-rush hour period, the steam trains giving way one by one to electric trains as fast as operating conditions permit.

New time-tables, carrying the new schedules, will become effective January 25. For the present, Dover will be served by 23 eastbound trains, operating via Newark, compared to 19 at present, in addition to the steam trains regularly operating via Paterson. The saving in running time will vary from 6 to 22 minutes.

Seventy miles of road, carrying 160 miles of track, are included in the Lackawanna electrification project, which is the first and only operation of multiple-unit service at 3,000-volt direct current in the United States. A total of 903 miles of copper and bronze wire and cable, weighing 3,220,000 pounds, and 8,000,000 pounds of steel were ordered for the overhead power transmission, while 141 new, two-car, all steel, units have been provided which can be operated in trains of from 2 to 12 cars each.

"If you want to indulge in the luxury and novelty of operating barges up and down our rivers, if you want to go on with the game of letting motor trucks carry cotton from the cotton fields, if you want to do all these new things, you—the American people—are going to pay for it, You will never be willing to pay the bill for your experiment . . . . You are going to perpetuate useful citizens, who might be conducting transportation, as apple sellers, if you are going to indulge in these by-plays and children's games of hauling the produce of this country on boats when it was intended to be hauled on rails."

—Walter B. Case
Case, Pomeroy & Co.

A. S. C. E. Meeting

The 78th annual meeting of the American Society of Civil Engineers was held in New York, January 21-23. Of the many technical papers presented, possibly the most interesting to railway engineers was one on "The Construction Features of the Chesapeake & Ohio Railway Three-Span Continuous Bridge over the Ohio River at Cincinnati, Ohio," presented by Wilson T. Ballard, vice-president of the J. E. Greiner Company, Baltimore, Md.

Court Hears Oregon Construction Case for Third Time

The second rehearing, the third hearing, of the injunction suit brought by the Oregon-Washington Railroad & Navigation Company to restrain the Interstate Commerce Commission from enforcing its order to construct 185 miles of new line in Oregon was held at Portland, Ore., on January 22, before Judges Rudkin and Wilbur of the circuit court of appeals and Judge McNary of the Federal district court. The rehearings in each case were necessitated by the deaths of two sitting judges.

Pleads for Fair Field in Present Competition

Dice urges employee aid in placing transport rivals on more equitable bases

While urging that railroad employees "Let consolidations take care of themselves," Agnew T. Dice, president of the Reading, in a recent address further advised them to concentrate their thoughts on "many problems facing the railroads as a whole and the employees in particular of greater importance for the future than consolidations." The address was delivered before the Veteran Employees Association of the Reading at its twenty-third annual meeting and banquet held in Philadelphia, Pa. on January 18.

In connection with his discussion of consolidation, Mr. Dice gave assurance that "no loyal worker of the Reading need be concerned regarding his job." The speaker next turned his attention to agencies of transportation now competing with the railways and cited the favorable conditions of taxation and regulation under which these competitors operate. All agencies he continued should be placed upon the same basis in the current fight for business; present chaotic conditions in the transport field, Mr. Dice thought, threatened the railway man's job more than did pending consolidation proposals.

Mr. Dice continued in part as follows:

"When every railroad employee realizes that unless the present unfair conditions are speedily remedied he or many of his fellows may have to change their occupation, and brings all the influence he can muster to bear on his representatives in the State Legislature in Congress, these representatives will realize their mistake in refusing earlier to provide for equality of competition as between the railroads and all other transportation agencies.

"Keep this clearly in mind; the railroads are not seeking to legislate their competitors out of existence. We are asking only for equality of opportunity in competing for the business of the public. The Interstate Commerce Commission has found, after a nation-wide investigation, that the railroads are and always must be the backbone of our national system of transportation. It follows that the national welfare is deeply concerned in fair treatment for the railroads and in the coordination of all transportation agencies so that all may have a fair opportunity to perform their

duties and may carry their fair share of the burden of taxation.

"Today the most important thing for all of us to do is to use our influence to restore public confidence. It is the time for us to uphold the hands of those who are earnestly thinking and working for the common good. It is no time for nostrums and cure-alls that are daily advocated by those who use conditions to advance personal fortunes. Never in our history has it been more important for each one of us to stop and think. Let us think and act not only to bring back that confidence in our institutions which some have lost but to advance our Nation to a place we should always occupy—leadership of the world."

Mr. Dice concluded his remarks with a resume of Reading activities during the past year.

Northwest Board Meeting

The Northwest Shippers' Advisory Board will hold its eighth annual meeting at St. Paul, Minn., on January 27. William H. Bremner, receiver for the Minneapolis & St. Louis, will be the principal speaker.

Traffic Club Meeting

The Birmingham Traffic and Transportation Club will hold its annual banquet on February 12. Edward F. Flynn, assistant general counsel of the Great Northern will be the principal speaker.

Correction

In an item entitled "Will Reduce Time of Chicago Havana Journey," which appeared in the *Railway Age* of November 22, reference was made to the "Dixie Flyer of the Illinois Central." This should have read the Dixie Flyer of the Chicago & Eastern Illinois.

Short-Notice Tariffs Disallowed

The Interstate Commerce Commission has denied the application of the Baltimore & Ohio for authority to publish on short notice passenger-rate tariffs applying from Washington to the Pacific coast on the basis of the regular rates to the gateways of Chicago, St. Louis, Memphis and New Orleans plus the reduced coach and tourist sleeping car fares recently put in effect by many western roads. The commission held that no emergency existed to justify publication of the through rates on less than the usual 30 days' notice.

Discuss Canadian Telegraph Merger

Merging of Canadian wireless and cable systems into a single company to work in association with Imperial and International Communications, Limited, of Great Britain, was the subject of discussion in Ottawa last week between Right Hon. R. B. Bennett, Prime Minister, and members of the Cabinet, and Sir Basil Blackett, chairman of the great British merger. The proposal made by Sir Basil is that the Canadian Pacific and the Canadian National shall "become partners" with the Imperial and International Communications, Limited, in forming a Canadian overseas communication company which will include the Canadian Marconi system. Conferences have already taken place between Sir Basil and E. W. Beatty, president of the Canadian Pacific, and Sir Henry Thornton, president of the Canadian National.

Long Locomotive Runs in New England

The Boston & Maine and the New York, New Haven & Hartford are now running locomotives through between New Haven, Conn., and Portland, Me., 271 miles; one passenger train and one freight train each way daily. The route is by way of New London, Putnam, Worcester, Ayer and Lowell. Preparations are being made for a similar arrangement between New Haven, Conn., and White River Junction, Vt., several trains each day; and also for freight trains between New Haven and Boston by way of Worcester and Ayer.

New York-Memphis Twice Daily

Trains 17 and 18 of the Southern have been merged with trains 35 and 36 so as to make a through train between Washington and Memphis with through sleeping cars to and from New York over the Pennsylvania. With the "Memphis Special" this will make two through trains daily each way between Memphis and eastern cities by way of the Norfolk & Western and Bristol. The new schedule provides for leaving New York at 11:10 a. m. and arriving at Memphis 6:10 p. m. the next day; leave Memphis 8:40 a. m. arrive New York 4:45 p. m.

More Two-Cent Rates

The Chicago, Milwaukee, St. Paul & Pacific, which on January 1 established a two-cents-a-mile passenger rate on certain divisions in Wisconsin, Minnesota and Iowa, has extended the rate to its lines from Flandreau to Wessington Springs and from Platte to Yankton in South Dakota, effective January 20.

The Mobile & Ohio has filed tariffs with the Interstate Commerce Commission reducing passenger fares on the system to two-cents a mile to meet similar reductions proposed by the St. Louis-San Francisco.

The Denver & Rio Grande Western has established a two-cents-mile passenger rate on its line between Grand Junction, Colo., and Montrose.

Interprets Maritime Rate Rule

A re-affirmation of its former decision as to the correct method of computing how the 20 per cent cut in Maritime freight rates should be arrived at is contained in a judgment of the Board of Railway Commissioners for Canada delivered in Ottawa last week.

The judgment is rendered by Hon. H. A. McKeown, Chief Commissioner, and concurred in by Commissioner T. C. Norris. It decrees that on westbound freight traffic, the point of whose origin lies within the "select region," the reduction shall be calculated on the ratio which the distance between that point of origin and the westerly limit of the "select area," Diamond Junction, bears to the whole distance from the point of origin to the ultimate destination. That is to say, a commodity transported, for example, from Moncton, N. B., to Calgary, Alta., enjoys the 20 per cent freight reduction not on the entire Moncton-Calgary rate, but on that proportion of the Moncton-Calgary rate which that commodity bears on the distance between Moncton and Diamond Junction, (or Levis, Que.).

Tax for Commercial Trucks in Missouri

Governor Henry S. Caulfield of Missouri, in his message to the fifty-sixth general assembly now in session at Jefferson City, Mo., recommended that consideration be given to the taxation and regulation of commercial truck lines which use the highways of the state for the transportation of freight in competition with the railroads. He also expressed the belief that motor buses and trucks should be restricted and regulated to protect those traveling in private vehicles and that limitations should be placed on equipment for the prevention of damage to the highways. He further stated that a tax should be levied to reimburse the state for damage to and wearing of the road and to recompense for the commercial use of the highways built with public funds.

Omaha Union Station Dedicated

The Union station at Omaha, Neb., was formally dedicated on January 15 when Carl R. Gray, president of the Union Pacific, opened the doors to the public. The committee of the railroads which participated in the dedication consisted of C. B. Seger, chairman of the executive committee of the Union Pacific, Carl R. Gray, president, Fred Sargent, president of the Chicago & North Western, H. A. Scandrett, president of the Chicago, Milwaukee, St. Paul & Pacific, L. A. Downs, president of the Illinois Central, F. E. Williamson, president of the Chicago, Burlington & Quincy, John Cannon, vice-president and general manager of the Missouri Pacific, H. G. Clark, vice-president of the Chicago, Rock Island & Pacific, S. E. Cotter, vice-president of the Wabash, and W. G. Lerch, vice-president of the Chicago Great Western.

C. N. R. Purchases Large

Last year, the Canadian National paid more than $100,000,000 to Canadian manufacturers and wholesalers for rolling stock, fuel, ties and general materials, according to a statement of R. C. Vaughan, vice-president in charge of purchases and stores. The railway spent $20,116,528 for rolling stock and heavy-duty equipment and $14,000,000 for fuel. These and the $16,215,870 spent for ties and other forest products were the heaviest purchases. Rails cost nearly $7,000,000 and track fastenings more than half that sum. Car parts and fittings, electrical and telegraph material, injectors, superheaters and specialties amounted to more than $4,000,000. Oils and gasoline made up an item of more than $2,000,000. Commissary supplies cost $2,709,132, steamship supplies little short of $3,000,000.

A million dollars was spent for stationery and printing. Other purchases consisted of bridges and structural steel, $851,942; air brake material, $689,373; bolts and

nuts and rivets, $542,676; carpet, $123,025; cement, $212,625; couplers, knuckles and repairs, $385,676; fencing, $122,000; firebrick, $188,272; office furniture, $71,000; gas, oxygen and acetylene, $680,000; ice, hay, straw, $385,100; electric lamps, $97,740; machinery and machine tools, $735,000; paints and varnishes, $584,515; roofing, $249,000; rubber and leather goods, $400,000; switch material, $804,183; typewriters and calculating machines, $80,283; uniforms and caps, $243,000; waste, $400,500; wheels, cast iron, $965,000; wire, iron and copper, $915,000.

Hudson County Smoke Ordinance

The Board of Health & Vital Statistics of Hudson County, New Jersey, has adopted a smoke ordinance prohibiting the making of dense smoke within the limits of the county, and establishing a department on smoke regulation. The rules define smoke as No. 3, No. 2, etc., according to the Ringelmann chart. Absolute prohibition is modified by certain exceptions; for example, there is an exception of a locomotive or a steamboat emitting dense smoke not more than two minutes in any period of 15 minutes. Other regulations measure the duration of offenses by half minutes. The construction or alteration of any furnace or stack, etc., can be carried out only on a permit from the smoke department. Violations of the ordinance will incur a penalty of fine or imprisonment or both.

An advisory board of three engineers has been appointed, consisting of Dr. Harvey N. Davis, Roy V. Wright, managing editor of the *Railway Age*, and Professor E. H. Whitlock of Stevens Institute of Technology.

Safety Meeting at Los Angeles

A regional meeting of the Safety Section of the American Railway Association was held at Los Angeles, Cal. on January 19, with J. B. Monahan, supervisor of safety of the Southern Pacific, as chairman. The program included the following addresses: "The Rolling Inspection of Trains," by W. L. Hack, Southern Pacific; "Influencing Employees to Safeguard Themselves," by J. A. Christie, Atchison, Topeka & Santa Fe; "Accidents in the Maintenance of the Way Department," by W. H. Kirkbride, Southern Pacific; "The Importance of Rule Observation," by Col. E. W. Mason Western Pacific; "Grade Crossing Accidents," by T. G. Hunter, California Railroad Commission; "Safety in Pole Line Construction," by W. E. Deardoff, Pacific Telephone & Telegraph Company; "The Supervisor's Responsibility Respecting Unsafe Practices," by C. T. Bailey, Oregon Short Line; "Accidents in the Mechanical Department," by H. C. Venter, Southern Pacific; and "Some Practical Thoughts on Safety," by J. D. Brennan, Southern Pacific.

Private Car Cases Argued in Supreme Court

Arguments were heard by the Supreme Court of the United States on January 15 and 16 in the two cases in which the Louisville & Nashville, the Kansas City Southern and other roads are seeking to have set aside the order of the Interstate Commerce Commission prohibiting railroads from hauling each others' business cars without a published tariff charge. Alfred P. Thom, for the L. & N., contended that the railway business car should be considered as a railroad facility, not as an article of property transported, and that pass passengers are guests of the railroads and are served without discrimination against paying passengers. D. W. Knowlton, chief counsel for the commission, contended that the private car is property such as may be hauled only under proper tariff rates. F. H. Moore, (K. C. S.) presented an argument on a different theory from that of Mr. Thom, contending that the roads have a right to contract between themselves on such terms as they see fit for the transportation of cars as private carriers.

Foes of Transportation

Presidential approval of the voluntary consolidation of eastern railroads into four systems is attacked by several senators. One of them declares the consolidation "more of a proposal to help the railroads out of their financial difficulties than it is in the public interest." Anything that is helpful to the railroads involves blood, thunder and corruption to a certain type of mind. And there's another horrifying possibility, which is that the consolidations may result in many economies. These are things usually in view in all business consolidations, and commended because they enable public corporations to give better and cheaper service to the public. But now such things, instead of being economically beneficial, are "playing politics with human misery," according to one senatorial commentator.

Hundreds of millions to peg up wheat quotations for the farmers, but not a thing that may relieve the heavy burdens and injustices loaded onto the railroads! They are, by some people, considered a menace to government, to the people, and to society in general. Senator Peffer, the long-whiskered Populist of Kansas, who flourished in the 1880's, thought so—or at least his mushroom party did. The fact is, transportation is just as important to the country now, in peace, as it was when the railroads were taken over by the government during the war and put in charge of McAdoo, who all but wrecked them, and left a record of governmental extravagrance and inefficiency in controlling great business that may well remain an example and warning to the American people for generations to come.

What certain U. S. senators need is a thorough course in the value of railroad transportation to the nation, and the unbiased history of the injustices done to the railroads by legislation, state and national, during the past twenty or thirty years. —From the Chicago Journal of Commerce.

George Washington Memorial Bridge

The suspension bridge now being rushed to completion across the Hudson river between Fort Washington, N. Y., and Fort Lee, N. J., has been named the "George Washington Memorial Bridge," it was recently reported to President Hoover by representatives of New York, New Jersey and the George Washington Bicentennial Commission, the body created by act of Congress to stage a world-wide celebration in 1932 of the 200th anniversary of the birth of George Washington. In giving the bridge this name, officials are responding to the request of the Bicentennial Commission that all great building and engineering projects now building or planned for completion by the end of 1932 be named in honor of the "Father of his Country." This is but one of the many ways in which the Commission plans to keep the ideals and achievements of Washington in the public mind from February 22, 1932, until Thanksgiving Day of that year.

Collision at Readville, Mass.

In an accident on the New York, New Haven & Hartford at Readville, Mass., 10 miles from Boston, on January 20, a fast express train westbound and a local passenger train eastbound came into collision at a crossover and one locomotive and two or three cars were overturned; but no person was reported killed. The engineman of the express was seriously injured and from 15 to 50 or more passengers were reported injured. Westbound train No. 175, the Colonial Express, from Boston to Washington, ran past the signal at the junction of the Midland division and collided with a local train from the latter division, which was crossing the path of the express. The locomotive of No. 175 struck the tender of the other train and together with that tender and two or three cars, was overturned. The engineman of No. 175 was pinned beneath the cab and was extricated only after the pressure of the cab was released by acetylene burners.

There was a blinding snow storm at the time and the only information thus far given as to the cause is a statement that the engineman of the express did not see the signal. The signalman in the cabin (at the point of collision) said that the signal was properly set at stop.

Regulation of Rail Competitors Advocated by Pelley

Regulation of highway carriers in order to eliminate present chaotic conditions in this field of transport was advocated by John J. Pelley, president of the New York, New Haven & Hartford, in a recent address before the Traffic Club of New York. Mr. Pelley proposed that motor coach lines be required to obtain certificates of convenience and necessity and that these permits be granted only in cases

where the public would be better served by the proposed service than by existing transportation agencies.

The speaker suggested that highway transportation be brought under control of state and national commissions with such bodies having power to fix and approve rates, routes and schedules and to issue regulations providing for safety of passengers, the adherence to published rates and promulgating a uniform system of accounting.

Mr. Pelley also urged that port-to-port rates of coastwise steamship lines be placed under the jurisdiction of the Interstate Commerce Commission, stating that many of these water lines are now publishing joint rates in conjunction with unregulated motor carriers.

Reopen Montreal Terminal Fight

By unanimous vote of the Montreal City Council last week, City Hall lawyers were instructed to lay before the Dominion Board of Railway Commissioners at Ottawa findings of the Technical Commission opposing projected Canadian National elevated tracks between Eastern Junction and Longue Pointe, and the decision of the Town Planning Commission that the north end of Montreal should remain strictly residential.

Proposals of the city experts that twenty-five street openings should be provided over the tracks running in an open trench for five miles from St. Leonard de Port Maurice to Eastern Junction were supplemented, on a motion by Ald. Alfred Legault, of Ahuntsic ward, with the demand that the railroad shall be held to keep open all existing streets and to furnish proper openings as dictated by the development of thoroughfares now non-existent. Electrification of locomotives on the belt line is to be requested; but the suggestion that the railroad at the same time be ordered to run a suburban service into the Tunnel terminal was laid aside. The railroad's plan provides for traversing this district by an elevated rather than a depressed line.

"Struck or Run Over"

The title, "Struck or Run Over," familiar to students of the accident records, *must receive preferred attention* by safety committees or railways shall fail to achieve the prescribed goal of "33 by '33"; fail to reduce casualties to employees one-third in three years; and this feature of the work is designated as the main task for the month of February, by L. G. Bentley, chairman of the Committee on Education, Safety Section, A. R A. His circular making this appeal (No. 291) is illustrated by nine pictures delineating common kinds of careless conduct on the part of trainmen and others.

There has been an encouraging decrease in the number of persons killed in this cause-class within the last seven years, but the record is still bad; the total of employees in 1929 was 413. This includes *nineteen* persons in the clerical class. Trackmen, as is well known, suffer the most; total 228. This is more than the total of all other classes combined. The final exhortation of the circular is addressed to trainmen (including enginemen) of whom the record of killed includes 119: "The remedy lies in the minds of these men. They are both intelligent and experienced and should realize that each chance taken brings them just that much nearer death. These men, better than any other class, *know the remedy* and should be required to use it."

German Government Sells Rail Securities

The Reich Finance Ministry has sold approximately $15,232,000 worth of 7 per cent preferred stock of the German National Railroad Company, according to a recent dispatch from Berlin to the New York Times. This sale, made to the Alliance & Stuttgart Life Insurance Company, marks the first sacrifice by the German government of any of its railroad holdings to a private company. A few weeks ago, however, the State-controlled National Employes' Insurance Company got 130,000,000 marks (approximately $30,000,000) of the same stock.

The Alliance & Stuttgart Insurance Company will pay the government approximately $13,090,000, a price equivalent to present quotations on the $15,232,000 stock acquired.

N. B. Opposes Lower Quebec Rates

A protest against the City of Quebec being included in the "select territory" (for 20 per cent lower rates) under the provisions of the Maritime Freight Rates Act, was voiced in St. John, N. B., last week, by Premier J. B. M. Baxter at a sitting of the Board of Railway Commissioners. Hon. Dr. Baxter said that with all due respect to the board, the attitude of New Brunswick was one of defiance in the matter.

He said that it was obvious that the request of Quebec to be included was referred to the board as a pure political pretext to quiet demands from the applicant territory until the last general election should be got over, and that the province of New Brunswick strenuously objected to being made a football for political purposes of this character.

"It is submitted," said Hon. Mr. Baxter, "that the Board of Railway Commissioners should report that neither they nor the Government have any authority to include within the 'select territory' any other lines or other territory than that which is already provided for. Reference to the preamble of the Maritime Freight Rates Act, 1927, shows that it was passed in consequence of the report of the Royal Commission on Maritime Claims made on September 23, 1926, and was adopted for the purpose of removing a burden imposed upon the Trade and Commerce of the Maritime Provinces since 1912. It had no relation to any other territory within the Dominion of Canada. To include any other territory derogates from the effect of the relief intended to be given by the adoption of these recommendations of the Duncan Commission, so called.

"The answer to the requests of the different bodies mentioned should be that they were not applicants for relief whose requests were in any way referred to the Duncan Commission; that the Duncan Commission made no report or recommendation with reference to them; that the only report of the Duncan Commission was in favor of relief within said specified territory, which might fairly be considered to be either the Maritime Provinces, or so adjunct to it that it necessarily had to be considered in order to afford the relief. It was intended to create a favored rate for this territory."

LaFollette Confers with Rail Presidents

Phillip F. LaFollette, governor-elect of Wisconsin, and son of the late Senator LaFollette of Wisconsin who so vociferously attacked the railroads during his career invited the presidents of the railroads operating in Wisconsin to confer with him on December 23, prior to his taking office on January 1, on the problems confronting the railways of that state. Those who attended the conference, which was held at the LaFollette country home near Madison, included S. B. Way, president of the Milwaukee Electric Railroad & Light Co., Fred W. Sargent, president of the Chicago & North Western, F. B. Seymour, president of the Chicago, Green Bay & Western, Bernard J. Fallon, vice-president of the Chicago, North Shore & Milwaukee, H. A. Scandrett, president of the Chicago, Milwaukee, St. Paul & Pacific, C. T. Jaffray, president of the Minneapolis, St. Paul & Sault Ste. Marie and F. E. Williamson, president of the Chicago, Burlington & Quincy.

B. J. Fallon; H. A. Scandrett: C. T. Jaffray; F. E. Williamson; S. B. Way; F. W. Sargent; P. F. LaFollette; F. B. Seymour

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Why Is It Possible To Produce In A Ten-Coupled Locomotive A More Efficient Operating Unit Than . . . . . Existing Mallets Of Comparable Tractive Power

BECAUSE of the application of Super-Power Principles, greater power out-put can be secured in five driving axles of the ten-coupled locomotive than in the eight driving axles of the Mallet. This gives an operating unit which will pull increased tonnage at higher operating speeds, substantially reducing operating and maintenance costs.

LIMA LOCOMOTIVE WORKS

Incorporated

LIMA OHIO

Freight Traffic in November

The volume of freight traffic transported by the Class I railroads in November, 1930, amounted to 32,295,282,000 net ton-miles, according to reports compiled by the Bureau of Railway Economics. Compared with November, 1929, this was a reduction of 16.6 per cent, and it was a reduction of 23.1 per cent under November, 1928. In the Eastern district, the reduction was 17.2 per cent; in the Southern 16.1 per cent, and in the Western 16.1 per cent. Total transported in the first 11 months of 1930 amounted to 393,078,920,000 net ton-miles, a reduction of 13.8 per cent under that of the corresponding period of 1929, and 10.6 per cent under 1928. The Eastern district total for the 11 months showed a reduction of 14.2 per cent; the Southern 14.2 per cent and the Western 13.2 per cent.

The average speed of freight trains in November was the highest for any corresponding period on record, amounting to an average of 14.1 miles an hour. This was an increase of 0.8 mile above the same month in 1929. The average speed of freight trains in the first eleven months of 1930 was also the highest on record, amounting to 13.8 miles an hour, compared with 13.1 miles in 1929.

Average daily movement per freight car in November, 1930, was 27.5 miles, compared with 32.4 miles for the same month in 1929 and 33.2 miles in November, 1928.

The average load per car in November, 1930, was 26.6 tons. This was a decrease of 0.6 ton below the average for November, 1929, and a decrease of 0.9 ton below that for November, 1928.

C. A. Gill to Undertake Reorganization of Russian Railroads

Charles A. Gill, superintendent of motive power, Eastern lines of the Baltimore & Ohio, has been selected by a commission representing the Russian Government to take charge of the modernization of all steam transportation systems in the Union of Socialist Soviet Republics. Mr. Gill, who has been given a leave of absence by the B. & O., will sail for Russia about February 1, taking with him a staff of American railway experts representing practically all branches of the industry. His appointment, which was made following an inspection of railroad methods in nearly every country in the world by groups of Russian railway officials, similar to the party which visited the United States and Canada last summer, gives him jurisdication over approximately 22,000 miles of main line extending from Moscow to Vladivostok.

Mr. Gill gained his first railroad experience as a machinist with the Baltimore & Ohio. After working on a number of other railroads he returned to the B. & O. as roundhouse foreman, and was promoted to his present position of superintendent of motive power, eastern lines, in 1917.

Co-incident with Mr. Gill's appointment, the Soviet authorities have also decided upon the "mobilization" in the full military sense of the word, of all persons competent to undertake railroad service, according to a dispatch from Moscow to the New York Times. The order, which is based upon a necessity of completely re-organizing the Soviet railway system, requires that all state departments, except those engaged in transportation or national defense, must submit within ten days a list of all their employees who formerly had any experience in or in connection with railway work. Such employees are to be immediately dispatched and are required to report within five days to government labor exchanges where they will be assigned new railroad jobs. Criminal proceedings will be taken against employees who try to evade the present order by concealing previous experience and against employers who permit such concealment or submit a false list.

Fruit Jobbers' Convention

Seventeen railroad presidents, two board-chairmen, and twenty-three vice-presidents attended the 27th annual convention of the Western Fruit Jobbers' Association of America at Phoenix, Ariz. on January 13-16. The transportation committee reported that competition between carriers had aided in bringing about speedier and improved service. In addition iceless refrigerator cars for the shipment of perishables and the speeding up of transportation between Los Angeles and Chicago were called for by C. I. Sawdey, president of the Western Growers' Protective Association. He declared that only seventh morning delivery in Chicago is afforded perishables under present circumstances though sixth day service is available for regular freight between Chicago and Los Angeles. H. M. Wigney, manager of Safety Refrigeration, Inc., New York, gave an address on the developments in the transportation of fruits and vegetables under automatic temperature control.

The railway officers in attendance forecast a return of business activity such that 1931 will be a "great buying year." The general impression of the railroad presidents was that consumers and buyers of products in practically all industries are low in stock and the replenishment of goods will necessarily follow. Among the railroad presidents who anticipated improved business conditions were Paul Shoup, Southern Pacific, Gen. W. W. Atterbury, Pennsylvania, James E. Gorman, Chicago, Rock Island & Pacific, L. W. Baldwin, Missouri Pacific, J. S. Pyeatt, Denver & Rio Grande Western, George P. McNear, Jr., Toledo, Peoria & Western, and Daniel Upthegrove, St. Louis Southwestern.

General Atterbury declared business to be on an upward trend, and said "it will not be many months before the railroads will follow in the wheel tracks that lead back to prosperity. We are preparing for a revival of business." Mr. Shoup called attention to the fact that the Southern Pacific recently put back on a full time basis thousands of workers in the maintenance department who had been working half time. Mr. Gorman said "The Rock Island is keeping its maintenance department at a high standard in preparation for the business sure to come. I feel," he said "right now American industries are picking up as a result of the low supply of commodities held by retailers." Mr. Baldwin said, "I am no optimist, but I believe 1931 holds a world of promises for business in America. I look for a gradual return to normalcy." Mr. Upthegrove declared: "There is nothing to worry about. The country is basically sound and there is ample money for legitimate projects. It will carry through the present emergency." Mr. Pyeatt stated that "business is making a gradual recovery. But the demand here, in fact all over the world, must become more healthy before markets will be definitely recovered."

The following railway officers were present at the convention:

Chicago Great Western, P. H. Joyce, chairman of the executive committee, V. V. Boatner, president, and Oscar Townsend, vice-president; Missouri-Kansas-Texas, George T. Atkins, vice-president; Western Pacific, J. F. Hogan, vice-president; Chesapeake & Ohio, J. J. Bernet, president; Texas & Pacific, J. L. Lancaster, president and J. B. Payne, vice-president; Erie, C. E. Denney, president and Carl Howe, vice-president; Union Pacific, Frank Robinson, vice-president; Missouri-Pacific, L. W. Baldwin, president and C. E. Perkins, vice-president; Chicago, Burlington & Quincy, H. H. Holcomb, vice-president and C. E. Spens, executive vice-president; American Refrigerator Transport, H. B. Kooser, president; St. Louis-San Francisco, J. R. Koontz, vice-president; New York Central, G. H. Ingalls, vice-president; St. Louis Southwestern, Daniel Upthegrove, president; Pennsylvania, Gen. W. W. Atterbury, president, J. L. Eysmans, vice-president, Elisha Lee, vice-president, and J. E. Weller, assistant vice-president; Chicago & Alton, W. G. Bierd, receiver and S. G. Lutz, chief traffic officer; Southern Pacific, Hale Holden, chairman executive committee, Paul Shoup, president, F. S. McGinnis, vice-president, J. T. Saunders, vice-president and J. H. Dyer, vice-president; Chicago, Rock Island & Pacific, J. E. Gorman, president; Pacific Fruit Express, H. Giddings, vice-president; New York Chicago & St. Louis, W. L. Ross, president and J. W. Graham, vice-president; Denver & Rio Grande Western, J. S. Pyeatt, president and B. H. Taylor, vice-president; Atchison, Topeka & Santa Fe, F. B. Houghton, vice-president; Wabash, J. E. Taussig, president; Great Northern, W. B. Kinney, vice-president; Southern Pacific of Mexico, H. B. Titcomb, president; Peoria & Pekin Union, E. I. Rogers, president; Toledo, Peoria & Western, Geo. P. McNear, Jr., president.

Advertising Agents Meet

The American Association of Railway Advertising Agents held its annual meeting at the Union League Club, Chicago, on January 17, President Ray Maxwell, advertising manager of the Missouri Pacific, presiding. The meeting was devoted to an open discussion of the various phases of railway advertising and included such subjects as co-operative and joint advertising, European advertising to induce American travel, methods of checking the results of advertising, and regional committees.

A lengthy discussion of the latter subject ended in a decision to continue regional committees throughout the country so that advertising men who are unable to attend the annual meeting may attend regional meetings and at least secure the views of advertising men in their immediate territories

On a proposal to issue a magazine for the association, the majority of those present expressed the belief that a magazine or bulletin published by the association would be of great benefit. It

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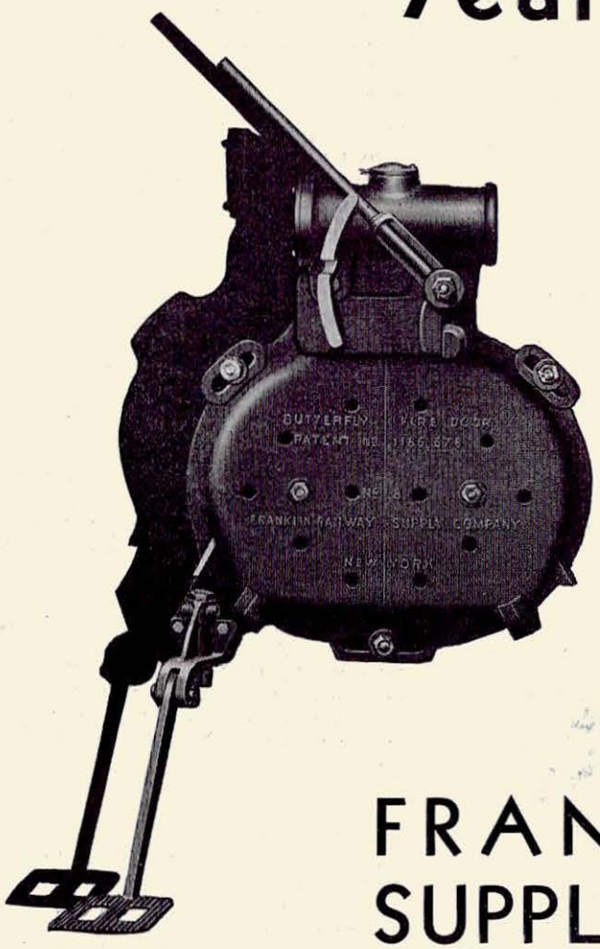
■ Here is the meat of the matter of automatic firedoors.

■ How complicated are they? What do they ask for maintenance?

What Will They Cost During The Next 10 Years?



For Franklin, over 60,000 Automatic Firedoors give answer. "Three, five, seven years without a penny of maintenance." The original Butterfly doors are still in service with a record of eighteen years behind them.

Fewer wearing parts, careful design that forestalls trouble and simplicity of construction, are responsible for the remarkable records of low "cost-per-year" common to all Franklin Automatic Firedoors.

FRANKLIN RAILWAY SUPPLY COMPANY, Inc.

NEW YORK CHICAGO SAN FRANCISCO ST. LOUIS MONTREAL

was decided that the president appoint a committee of four to publish a mimeographed bulletin at intervals throughout the year, the time of publication to be governed by the value of the material in hand.

The principal speakers at a luncheon given for members were Frank W. Noxon, secretary of the Railway Business Association, and D. M. Bowman, Passenger Traffic Manager of the New York Central, who spoke on co-operative advertising.

The present officers were re-elected as follows: President, Ray Maxwell, Missouri Pacific; vice-presidents, O. J. McGillis, Great Northern; W. S. Davis, Reading; F. Q. Treadway, Southern Pacific; C. W. Higgins, Canadian National, and I. R. Malpica, National Railways of Mexico; treasurer, H. P. Riccadonna, Chicago Great Western; and secretary E. A. Abbott of Poole Brothers, Chicago.

The next annual meeting will be held on January 16 and 17, 1932.

Western Pacific Speeds Up Trains

Marked reductions have been made in the time of the Scenic Limited, which operates from San Francisco, Cal., over the Western Pacific, the Denver & Rio Grande Western, the Chicago, Burlington & Quincy and the Missouri Pacific, to Chicago and St. Louis, and the Pacific Express which operates over the Western Pacific to Salt Lake City. The shortening of schedules is made possible by the improvements to road and equipment made during the past few years. The schedule of the Scenic Limited was cut 11¼ hr. between San Francisco and Chicago and 8½ hr. between San Francisco and St. Louis. The Pacific Express is cut 6½ hr. between San Francisco and Salt Lake City. In addition, a new train, known as the Feather River Express, is now in service between San Francisco and Reno, Nev., in order to relieve the Pacific Express from local work.

The Scenic Limited now leaves San Francisco at 10 a. m., as formerly, and arrives in Chicago at 7:45 p. m. the third evening instead of 7 a. m. the fourth morning. Returning, it leaves Chicago at 10:30 a. m. instead of 11:30 p. m. and arrives at San Francisco as formerly. The St. Louis section leaves San Francisco at 6:30 p. m. instead of 10 a. m. and arrives in St. Louis at 4:10 p. m. the third evening as formerly. West bound the train leaves St. Louis at 2 p. m. as formerly and arrives in San Francisco at 9:45 a. m. instead of 4:15 p. m. The Pacific Express now leaves San Francisco at 6:30 p. m. instead of 8 p. m. and arrives in Salt Lake at 8:30 p. m. the following evening instead of 4:30 a. m. the second morning. Returning it leaves Salt Lake at 7:45 a. m. instead of 11 p. m. and arrives in San Francisco at 9:45 a. m. the next morning. The Feather River Express leaves San Francisco at 9 p. m. and arrives at Reno at 12:30 p. m. the next day; returning, leaves Reno at 4.20 p. m. and arrives in San Francisco at 8 a. m.

The shortening of the schedule of the Scenic Limited on the Denver & Rio Grande Western and a more rapid handling over the Southern Pacific will also improve service between San Francisco and Chicago over the Southern Pacific, the Denver & Rio Grande Western and the Chicago, Rock Island & Pacific. Cars leave San Francisco at 6 p. m. instead of 12 noon and arrive in Chicago at 6:59 a. m. the fourth morning as previously. Returning they leave Chicago at 11:30 p. m. as formerly and arrive in San Francisco at 8:30 a. m. the fourth morning instead of 4:50 p. m.

William H. Onken, Jr., editor-in-chief of the Electrical World, has been elected Vice-President of the National Association of Owners of Railroad and Public Utility Securities. He will make his headquarters in New York City.

* * * *

Architect's Drawing of the Canadian Pacific's New Park Avenue Station, Montreal, Que.

Situated on a spacious and attractively landscaped plot at the head of Park avenue on Jean Talon street, the new building will serve the northern sections of Montreal and of Outremont. Three stories high, of combined classical and modern architecture and stone and marble construction, the station, 234 ft. by 87 ft., will cost well over $500,000. It will include all passenger conveniences and full express-handling facilities, and will be connected by a subway with platforms serving tracks from the C. P. R.'s Windsor Street and Place Viger stations. The contractors, Anglin-Norcross, Ltd., expect to complete construction by October, 1931.

Equipment and Supplies

LOCOMOTIVES

The Minneapolis, St. Paul & Sault Ste. Marie is inquiring for from 10 to 15 locomotive tenders of 12,000 gal. capacity.

The Inland Steel Company has ordered two six-wheel switching locomotives from the American Locomotive Company. Inquiry for this equipment was reported in the *Railway Age* of October 25.

FREIGHT CARS

The Seaboard By-Products Coal Company has placed a contract with the Standard Steel Car Company for repairs to 248 hopper cars.

The State Railways of Greece are inquiring for 200 mechanical refrigerator cars of 30 metric tons capacity. J. Drossopoulos, president, Athens, Greece.

IRON & STEEL

The Illinois Central has ordered 210 tons of structural steel for a bridge at Pullman, Ill., from the Continental Bridge Company.

The Baltimore & Ohio has ordered 200 tons of structural steel for work at Philadelphia, Pa., from the Bethlehem Steel Company.

The Union Pacific has ordered 650 tons of structural steel for a highway bridge at Columbus, Neb., from the Paxton Vierling Iron Works.

The Southern has ordered 30,655 tons of rail from the Tennessee Coal, Iron & Railroad Company and 4,445 tons from the Bethlehem Steel Company.

The Southern Pacific has ordered 63,764 tons of rails, dividing the order equally among the United States Steel Corporation, the Bethlehem Steel Company and the Colorado Fuel & Iron Co.

The Canadian National has ordered 34,000 tons of 130-lb. rail from the Dominion Steel & Coal Corporation, Sydney, Nova Scotia. The rail is to be laid on the main line between Montreal and Chicago, and will be sufficient to lay 170 miles of track.

In the legislature of California a joint resolution, for transmission to the Interstate Commerce Commission, has been offered calling for the inauguration of through passenger train service between the Atlantic seaboard and the Pacific coast by the elimination of the necessity for a change of trains at Chicago. The resolution avers a need for avoiding the confusion that now exists.

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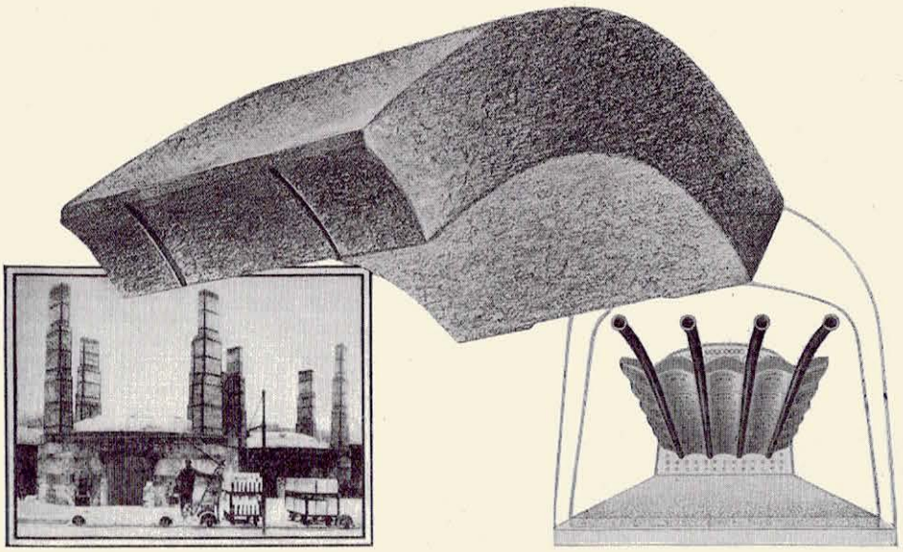
RESPONSIBILITY . . . Well-placed



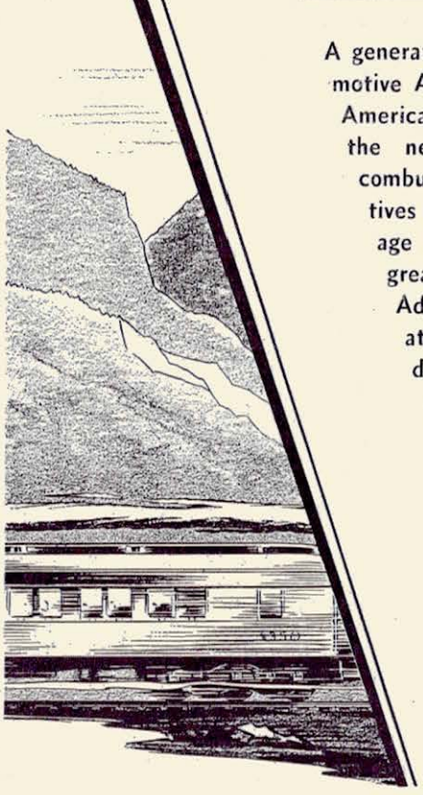
THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK

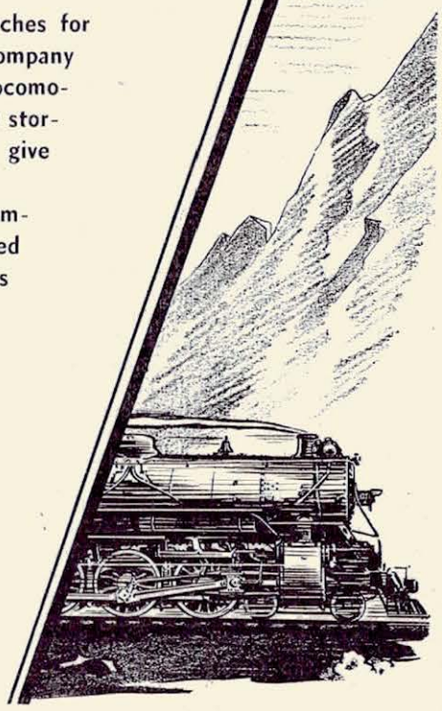
A generation of railroad men have put the matter of locomotive Arches up to American Arch Company.

American Arch Company has designed the Arches for the new locomotives. American Arch Company combustion experts have checked over the locomotives on their first runs; have helped organize storage systems; have developed methods that give greater mileage from Arch Brick.

Added to this has been constant, systematic research that steadily improved design and simplified brick shapes and sizes.

Those roads who have entrusted their locomotive Arches to American Arch Company are daily deriving a real dollars and cents benefit from the service given by these locomotive combustion experts.





Harbison-Walker Refractories Co.
Refractory Specialists

American Arch Co.
INCORPORATED
Locomotive Combustion Specialists

Supply Trade

The Inland Steel Company plans to construct a sheet, plate and strip mill at its Indiana Harbor, Ind., plant during the spring.

A. D. Engle, sales engineer of the **Austin Company,** with headquarters in New York, has been appointed district sales manager, with headquarters in the newly opened office at Boston, Mass.

William K. Krepps, manager of the eastern railroad department of the **Crucible Steel Company of America,** at New York, has been appointed general manager of the railroad department of that company, with headquarters at New York.

The Aluminium Company of America, Pittsburgh, Pa., at a recent meeting of the board elected **E. S. Fickes, G. R. Gibbons,** and **R. E. Withers** senior vice-presidents; **Harwood Byrnes, S. K. Colby, W. C. Neilson, G. J. Stanley, P. J. Urquhart,** and **I. W Wilson,** were elected vice-presidents.

The Southwark Foundry & Machine Co. has transferred the major portion of its assets to the **Baldwin-Southwark Corporation,** at Eddystone, Pa. The latter corporation has assumed all outstanding liabilities and is carrying on the entire business formerly done in the name of the Southwark Foundry and Machine Co.

The Mohair Institute has been organized and will open headquarters at 7 South Dearborn street, Chicago. The Institute has been formed to further the interests of the American mohair industry. Mohair used in railroad car upholstery will be given special attention. **A. C. Gage,** editor of the Angora Journal, will be the director of the Institute.

The James H. Knapp Company, Los Angeles, Cal., with a branch at San Francisco, has been appointed exclusive Pacific Coast distributor of the products of the **Illinois Testing Laboratories, Inc.,** Chicago, consisting of portable and stationary indicating pyrometers, resistance thermometers and other electrical and magnetic measuring instruments.

Herbert A. May, who is identified with a number of local manufacturing concerns and banks in the Pittsburgh, (Pa.), district, has been appointed assistant to the president of the **Westinghouse Electric & Manufacturing Company.** Mr. May will have his headquarters in the Grant building, Pittsburgh, where the offices of the Westinghouse central sales district are located.

The Industrial Brownhoist Corporation, will consolidate the Cleveland, Ohio, and Bay City, Mich., manufacturing operations of the corporation in one plant at Bay City as promptly as conditions make it possible to do so, retaining at Cleveland the general offices including the administrative, financial, sales, purchasing, accounting, and part of the engineering departments. Six to eight months will probably be required for the gradual transfer of manufacturing operations to Bay City.

R. R. Wason has been elected president of **Manning, Maxwell & Moore, Inc.,** New York, to succeed **C. A. Moore,** who was president of the company since April, 1927. Mr. Moore retains his contact with the company as chairman of the board of directors. Mr. Wason was also elected president of the Consolidated Ashcroft Hancock Company, Inc., one of the subsidiaries of Manning, Maxwell & Moore, Inc. Mr. Wason's entire career has been connected with merchandising and management problems. He was for many years director of merchandising of the Proctor & Collier Company, Cincinnati, Ohio. Early in 1922 he came East to represent banking interests in the Clark Lighter Company.

OBITUARY

Orton L. Prime, president of the Prime Manufacturing Company, Milwaukee, Wis., died on January 14. Mr. Prime had been active in the railroad field for many years.

Financial

ATCHISON, TOPEKA & SANTA FE.—*Acquisition.*—This company has applied to the Interstate Commerce Commission for authority to acquire control of the North Plains & Santa Fe by purchase of its capital stock and the Panhandle & Santa Fe has asked for authority to acquire control by lease and to operate the lines.

CANADIAN NATIONAL. — *Bonds.* — This company has sold to Dillon, Read & Company under competitive bidding an issue of $50,000,000 of its 4.5 per cent 25-year bonds. The issue is now being offered to the public by Dillon, Read & Company and nine other bankers at 98.25, to yield over 4.6 per cent.

CHESAPEAKE & OHIO.—*Abandonment.*—Examiner C. P. Howard of the Interstate Commerce Commission has recommended in a proposed report that the commission authorize this company to abandon a branch line from Mount Sterling to Rothwell, Ky., 19.5 miles.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC.—*Abandonment.*—This company has applied to the Interstate Commerce Commission for authority to abandon a line of 16.9 miles from Boulder Junction to Velasco, Wis.

MISSISSIPPI EXPORT.—*Stock.*—The Interstate Commerce Commission has authorized this company to issue $26,000 of common stock to be sold at not less than par to existing stockholders.

MISSOURI PACIFIC.—*Purchase of Terminal Roads.*—This company has purchased the controlling two-thirds interest in the North Kansas City (Mo.) Industrial District, and the St. Joseph (Mo.) Belt and the Union Terminal of St. Joseph for an unannounced consideration. The North Kansas City Industrial District control was purchased from Armour & Co. and Swift & Co., with the Chicago, Burlington & Quincy retaining a one-third interest. The two terminal lines, purchase of which is subject to approval of the Interstate Commerce Commission, comprise about 45 miles of lines, and provide the Missouri Pacific with a direct entry into the stock yards at South St. Joseph.

NEW YORK CENTRAL.—*Abandonment.*—Examiner R. R. Molster of the Interstate Commerce Commission has recommended in a proposed report that the commission authorize this company and the Cleveland, Cincinnati, Chicago & St. Louis to abandon the line from Beesons to Hagerstown, Ind., 13 miles.

NEW YORK CENTRAL.—*Equipment Trust.*—This company has applied to the Interstate Commerce Commission for authority to assume obligation and liability for an issue of $7,020,000 of 4½ per cent equipment trust certificates, for which it proposes to invite competitive bids.

NEW YORK CENTRAL.—*Equipment Trust.*—The Chase Securities Corporation and two other bankers are offering $7,020,000 of 4.5 per cent equipment trust of 1930 certificates of this company priced to yield from 2.5 to 4.125 per cent, subject to approval of the Interstate Commerce Commission.

NORFOLK & WESTERN.—*Accounting for Coal Properties.*—Division 4 of the Interstate Commerce Commission has issued an order that this company's investment in the Howard, Vulcan and Coal Creek collieries, including commercial coal stocks maintained at these collieries shall be classified as investment in miscellaneous or non-transportation property in the company's accounts and included in balance-sheet account 705, "miscellaneous physical property." A somewhat similar order was issued by the commission in 1928 and the company asked for a reconsideration, contending that the properties involved are owned by the railroad, operated by its employees, and that the coal is used exclusively in its common-carrier operations and that they should be classified as carrier properties. The commission ruled that the accounting for the operation of the collieries and for the coal produced should be in accordance with the effective accounting classifications.

OHIO RIVER & WESTERN.—*Abandonment.*—Examiner O. D. Weed, of the Interstate Commerce Commission, has recommended in a proposed report that the commission authorize this company to abandon its line from Bellaire to Woodsfield, Ohio, 42 miles, but that it require the acquisition by the Pittsburgh, Ohio Valley & Cincinnati and operation by the Pennsylvania, of part of the line

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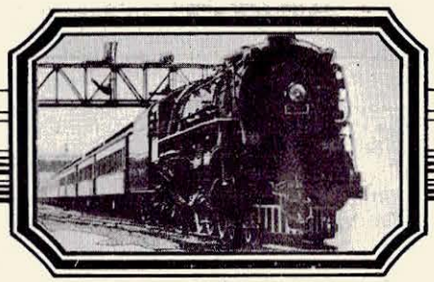

ALCO ALCO

To-morrow's Profits

STANDARD STATISTICS referring to one of the large systems, states:

"Operating expenses were again closely controlled in November. Maintenance ratio for the month was reduced to 30.4 per cent as against 34.8 per cent a year ago. The fact that net income for the 11-month period ended with November, after all charges and sinking fund appropriations, declined only 5.2 per cent in comparison with corresponding 1929 period, is largely attributable to increased efficiency and more economical operation. Heavy expenditures for improved facilities and new equipment in recent years have permitted sharp reductions in maintenance outlay without impairment of normal physical condition."

As a rule, the Railways making the best showing today are those having the greatest proportion of modern power.

Modern locomotives bought today are an investment in tomorrow's profits regardless of the then existing business conditions.

American Locomotive Company
30 Church Street New York N.Y.

ALCO ALCO

between Bellaire and Key, Ohio, 11.5 miles.

OWASCO RIVER.—*Abandonment.*—The Interstate Commerce Commission has authorized this company to abandon operation over the so-called northern segment of its line, about one mile in length, at Auburn, N. Y.

PENNSLYVANIA.—*Increased Rental for Long Island.*—The Interstate Commerce Commission has re-opened for further hearing the proceeding in which the Pennsylvania and Long Island are seeking approval of an operating contract under which the Long Island will pay an increased rental for the use of Pennsylvania terminal facilities in New York. After the Commission had disapproved the contract proposed the companies submitted a revised contract.

PENNSYLVANIA.—*Stockholders Suit.*—A stockholder of this company has instituted a suit in the Federal Court at Brooklyn, N. Y., against the directorate of the company alleging that its treasury is suffering a loss of over 2.5 millions in the excess of carrying charges over dividends on its holdings of Lehigh Valley and Wabash stock and asking that the court require the company to divest itself of these securities.

SEABOARD AIR LINE.—*Bonds.*—Because of the receivership proceedings the Interstate Commerce Commission has dismissed this company's application, filed on October 31, for authority for an issue of $1,710,500 of first and consolidated mortgage bonds.

STANLEY, MERRILL & PHILLIPS.—*Abandonment.*—Examiner O. D. Weed of the Interstate Commerce Commission has recommended in a proposed report that the commission authorize this company to abandon its line from Gilman to Walrath, Wis., 20 miles.

TEXAS & PACIFIC.—*Bonds.*—The Interstate Commerce Commission has authorized this company to issue $19,730,000 of general and refunding mortgage 5 per cent, series D, bonds, maturing in 1980; $13,000,000 of the bonds to be sold to J. P. Morgan & Co. at 96, making the average annual cost to the railway 5.226 per cent. The remainder of the bonds are to be pledged as collateral security, from time to time, for short term notes.

Dividends Declared

Cleveland, Cincinnati, Chicago & St. Louis.—Common, 5 per cent; Preferred, 1¼ per cent, quarterly, both payable January 31 to holders of record January 21.

Maine Central.—Preferred, 1¼ per cent, quarterly, payable March 2 to holders of record February 16.

Michigan Central.—25 per cent, payable January 31 to holders of record January 2..

International Railways of Central America.—Preferred, $1.25, quarterly, payable February 16 to holders of record January 31.

Missouri-Kansas-Texas.—Preferred A, $1.75, quarterly, payable March 31 to holders of record March 5.

Average Prices of Stocks and of Bonds

	Jan. 20	Last week	Last year
Average price of 20 representative railway stocks.	89.61	88.46	128.99
Average price of 20 representative railway bonds..	94.07	93.75	92.78

Construction

BANGOR & AROOSTOOK.—This company has received a bid for the construction of a bridge at Brownville, Me., over the Pleasant river to cost $52,223. A bid has also been received for the construction of a bridge at Houlton, Me., over the Meduxnekeag river to cost $54,375.

CANADIAN NATIONAL.—A contract for the erection of a new fruit warehouse at Guy street, south of the Bonaventure station tracks, in Montreal, Que., has been awarded to the Atlas Construction Company, of Montreal, according to an announcement by C. E. Brown, chief engineer in charge of the Montreal Terminals. Work is to begin immediately, the E. G. M. Cape & Company having just completed the foundations. It was also announced that contracts for the excavation of a large section of the area to be used for the new Central Terminal, as well as for the installation of certain concrete foundations on that site, have been awarded to the Northern Construction Company and J. W. Stewart, of Montreal. The new fruit warehouse will be 638 ft. in length, with a width of 76 ft. It will be three stories in height, fireproof, modern in all respects and will be suited for the handling of perishable commodities, such as fresh fruits and vegetables. It provides, among other things, for an auction room on the second floor which will accommodate 200 dealers seated at double desks, a large warehouse for the ripening and storage of fruits and vegetables, a cafeteria and about 17,000 feet of office space to be divided according to the needs of the tenants. Three large freight elevators will meet the requirements in moving fruit between basement and other floors and the building will be provided with two sets of tracks having a total capacity of 50 cars. A continuous platform reaching from the cars to the warehouse will be built so that a minimum of time and effort will be necessary for unloading.

CANADIAN PACIFIC.—Company forces have undertaken grade reduction on 25 miles of line between Savona, B. C., and Spences Bridge, along the Thompson river. A contract for six miles of this project has been awarded to the Campbell Construction Company, Calgary, Alta. This project involves the expenditure of about $750,000, the excavation of 500,000 cu. yd. of material and reduction of grade from 1 per cent to 0.4 per cent.

CHICAGO, ROCK ISLAND & PACIFIC.—The Interstate Commerce Commission has authorized this company to construct a 3-mile line extending southward from Bowlen, Mo.; estimated cost $59,418.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC.—A contract for the construction of a one- and two-story freight warehouse and office building at Graham Park (St. Paul), Minn., adjoining Minnesota Transfer, has been awarded to C. F. Haglin & Sons Co., Minneapolis, Minn. This structure will be of brick and concrete construction with outside dimensions of 300 ft. by 75 ft. The total expenditure involved in the project will be about $100,000.

ERIE.—The Public Service Commission of New York has advised this company that it does not consider excessive the bid of $56,337 submitted by the Newhall Company, Cleveland, Ohio, for the elimination of King crossing on the Nunda-Portageville highway, Portage, N. Y., and has directed the railroad to award the necessary contract and begin work as soon as practicable. The Commission has also designated for elimination the Paingleton, Middle, and Winship crossings, New Albion, N. Y., by construction of a marginal highway northeast of the railway, and has ordered the reconstruction of the bridge carrying the Erie tracks over the Hamburg-North Collins county highway in Eden, N. Y.

GULF, MOBILE & NORTHERN.—A contract for 1,000,000 cu. yd., hydraulic dredging to be deposited as fill for a new freight yard at New Orleans, La., has been awarded to the McWilliams Dredging Company, New Orleans.

LEHIGH VALLEY.—The New York Public Service Commission has approved plans and an estimate of cost amounting to $125,500 for elimination of the Dean crossing of this company's tracks on the Cayuta-Swartwood highway, two miles southeast of Cayuta station, Cayuta, N. Y.

MISSOURI-KANSAS-TEXAS. — This company will receive bids until February 16 for the construction of the superstructure of its new bridge over the Missouri river at Boonville, Mo.

OMAHA, LINCOLN & BEATRICE.—This company plans the construction of a terminal warehouse building at Nineteenth and Y streets, Lincoln, Neb., at a cost of about $250,000.

PENNSYLVANIA.—An estimate of cost of $61,925 for the reconstruction of the bridge carrying tracks of this company over the Horseheads-Montour Falls state highway, two miles north of Pine Valley, Veteran, N. Y., has been approved by the Public Service Commission of New York.

SOUTHERN PACIFIC. — The Interstate Commerce Commission has authorized this company and the Central Pacific to construct an extension to a line of the Central Pacific from Isleton, Calif., southeasterly, 2.5 miles; estimated cost, $151,840.

UNION PACIFIC.—The Nebraska Department of Public Works has awarded the general contract for the construction of a viaduct over the tracks of this railroad at Columbus, Neb., to the Woods Brothers Construction Company, Lincoln, Neb., at a cost of $161,109. A contract for structural steel was let to the Paxton & Vierling Iron Works, Omaha, at a cost of $40,037. The total cost of the viaduct, which will be of reinforced concrete and steel construction, will be about $220,000.

THE WABASH has added ten-section three-bedroom sleeping cars and twelve-section drawing room cars to trains 12 and 5 running between Chicago and Detroit.

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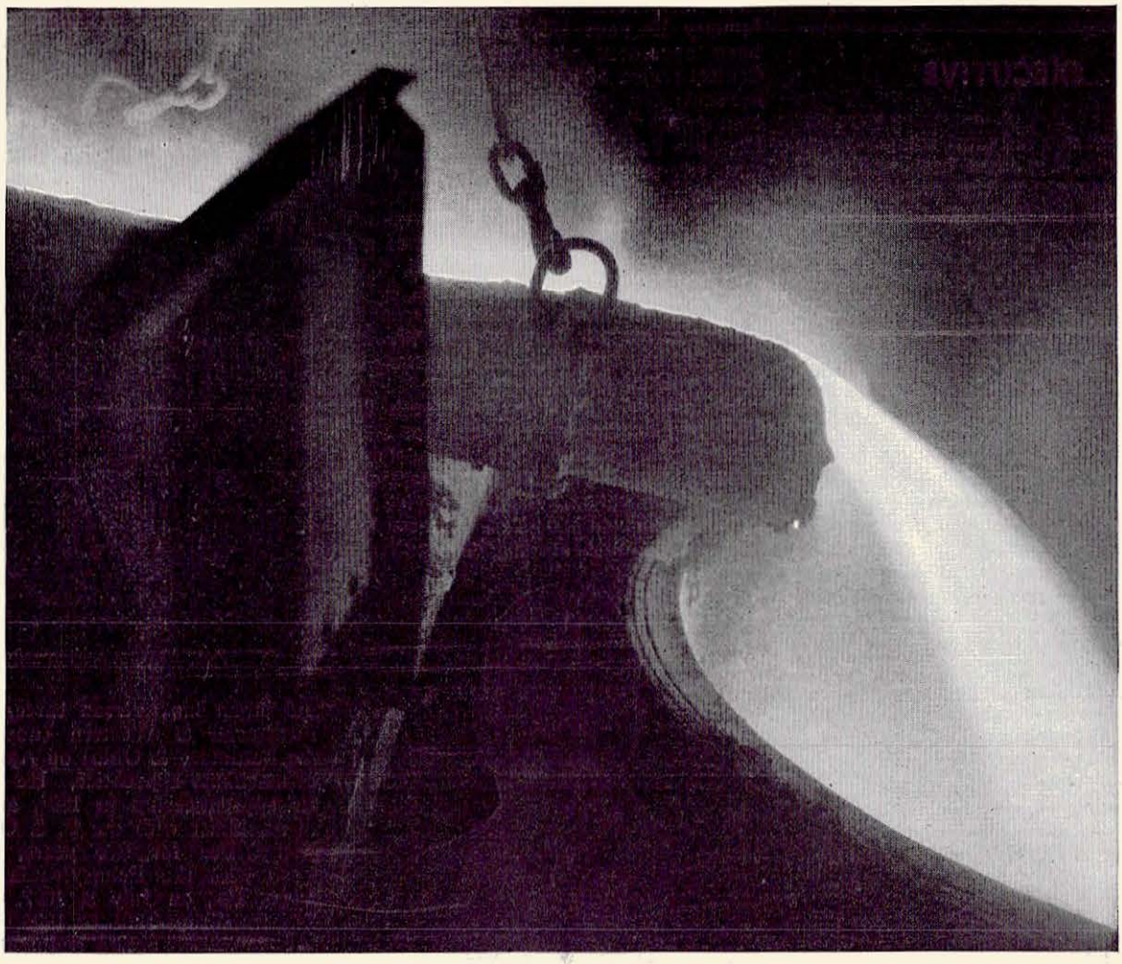

Production Facilities to Assure Alloy Quality

The condition of the open hearth furnace is a basic determinant of alloy quality. When a heat of Illinois Alloy is to be started, the alloy crews never allow a furnace to be charged until they know that that furnace meets every exacting melting standard for the production of dependable alloys. Of Illinois Steel Company's ninety-four open hearth furnaces, certain ones are reserved exclusively for alloy production. From these the alloy crews select for each heat, those furnaces best suited to their needs. Thus, vast facilities are turned to small production needs, that quality may be protected.

U S STEEL

Illinois Steel Company

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 South La Salle Street, Chicago, Ill.

ILLINOIS *alloy* STEEL

Railway Officers

EXECUTIVE

Donald V. Fraser, assistant purchasing agent of the Missouri-Kansas-Texas at St. Louis, Mo., has been appointed office manager for the president and chairman of the board at that point.

T. E. Brooks, general manager of the Louisville & Nashville, has been appointed vice-president in charge of operation, with headquarters as before at Louisville, Ky., succeeding **George E. Evans,** deceased. **William E. Smith,** assistant general manager at Louisville, has been promoted general manager to succeed Mr. Brooks.

E. W. Smith, who has been appointed co-receiver of the Seaboard Air Line, as announced in *Railway Age* of January 10, was born in Clarksburg, W. Va., on September 21, 1885. He was graduated from the Virginia Polytechnic Institute in 1905 and entered railway service in June of that year. Mr. Smith served in various positions in the motive power department of the Pennsylvania and was appointed assistant master mechanic at Wilmington, Del., in October, 1913. He was transferred in the same capacity to Altoona, Pa., in April, 1915. The following year he became assistant engineer of motive power. He was transferred to Harrisburg, Pa., on October 10, 1917, as master mechanic, and on May 26, 1918, he was transferred to Williamsport as superintendent of motive power. He returned to Altoona as superintendent of motive power in December, 1919, and the following year was promoted to engineer of transportation on the staff of the vice-president in charge of operation at Philadelphia. He was appointed general superintendent of motive power at St. Louis, Mo., on October 15, 1922; two years later was promoted to general superintendent of the Western Pennsylvania division and in September 1926, he was appointed general manager of the Eastern region. Mr. Smith, in September, 1928, was advanced to regional vice-president of the Pennsylvania, the position from which he recently resigned.

E. W. Smith

As announced in *Railway Age* of January 10, page 175, **J. F. Deasy** has been appointed vice-president of the Central region of the Pennsylvania, with headquarters at Pittsburgh, Pa., succeeding **E. W. Smith,** resigned, **F. W. Hankins** has been promoted to assistant vice-president, operation, in addition to his position as chief of motive power, **Walter S. Franklin** has undertaken the newly created position of assistant to vice-president, operation, with headquarters at Philadelphia, Pa., **S. T. Stackpole** has been appointed assistant vice-president at Detroit and **W. M. Wardrop** has been appointed assistant to vice-president at Chicago.

Mr. Deasy was born on March 25, 1882, at Hammerton, Pa. He was educated in the public schools, Philadelphia Textile School, and Brown Preparatory School, and entered railway service on June 10, 1901, as telegraph operator for the Pennsylvania, serving consecutively

J. F. Deasy

to September 13, 1907, as clerk and operator, and as clerk in the yards and stations. From August 7, 1908, to May 26, 1918, he served as acting extra agent of the Amboy division, acting terminal and shipping agent at South Amboy, extra agent and supervising agent on the Trenton division and assistant freight claim agent for the same road. On the above mentioned date he was appointed superintendent of stations and transfers, lines east of Pittsburgh, and two years later he became assistant chief of transportation in charge of freight transportation. On February 1, 1927, he was promoted to chief of freight transportation and in June, 1928, he became assistant vice president in charge of operation.

Mr. Hankins was born in London, England, in 1876, and came to this country in 1880. He received his education in the public schools at Foxburg, Pa.,

Frederick W. Hankins

and began his railroad career with the Pittsburgh & Western (now part of the Baltimore & Ohio) on April 1, 1891, as machinist apprentice. He completed his apprenticeship in 1894, and served as machinist with the B. & O. at Allegheny, Pa., for two years, beginning work with the Pennsylvania at Pittsburgh, Pa., on July 8, 1897, as a machinist. From 1901 to 1905, Mr. Hankins served as acting enginehouse foreman, machinist and leading machinist of the Pennsylvania at Pittsburgh, and from April, 1905 to January 1, 1919, he served successively as enginehouse foreman, machine shop foreman, general foreman and master mechanic of the Cumberland Valley (now part of the Pennsylvania) at Chambersburg, Pa. During the period of Federal control, he was transferred as master mechanic

Walter S. Franklin

to the office of the general superintendent of motive power of the Pennsylvania, with headquarters at Philadelphia,

"Inevitably, the railroads, by their very indispensable service, must persist and grow stronger. And just as certainly the bus lines must be relegated to their place of doing the work that cannot be done by the railroads. This is the problem. To foster the growth of bus lines where they are not needed, simply for profits, is in violation of the law of economy of effort, is opposed to orderly progress, is a thoughtless endeavor!"

—Commercial & Financial Chronicle

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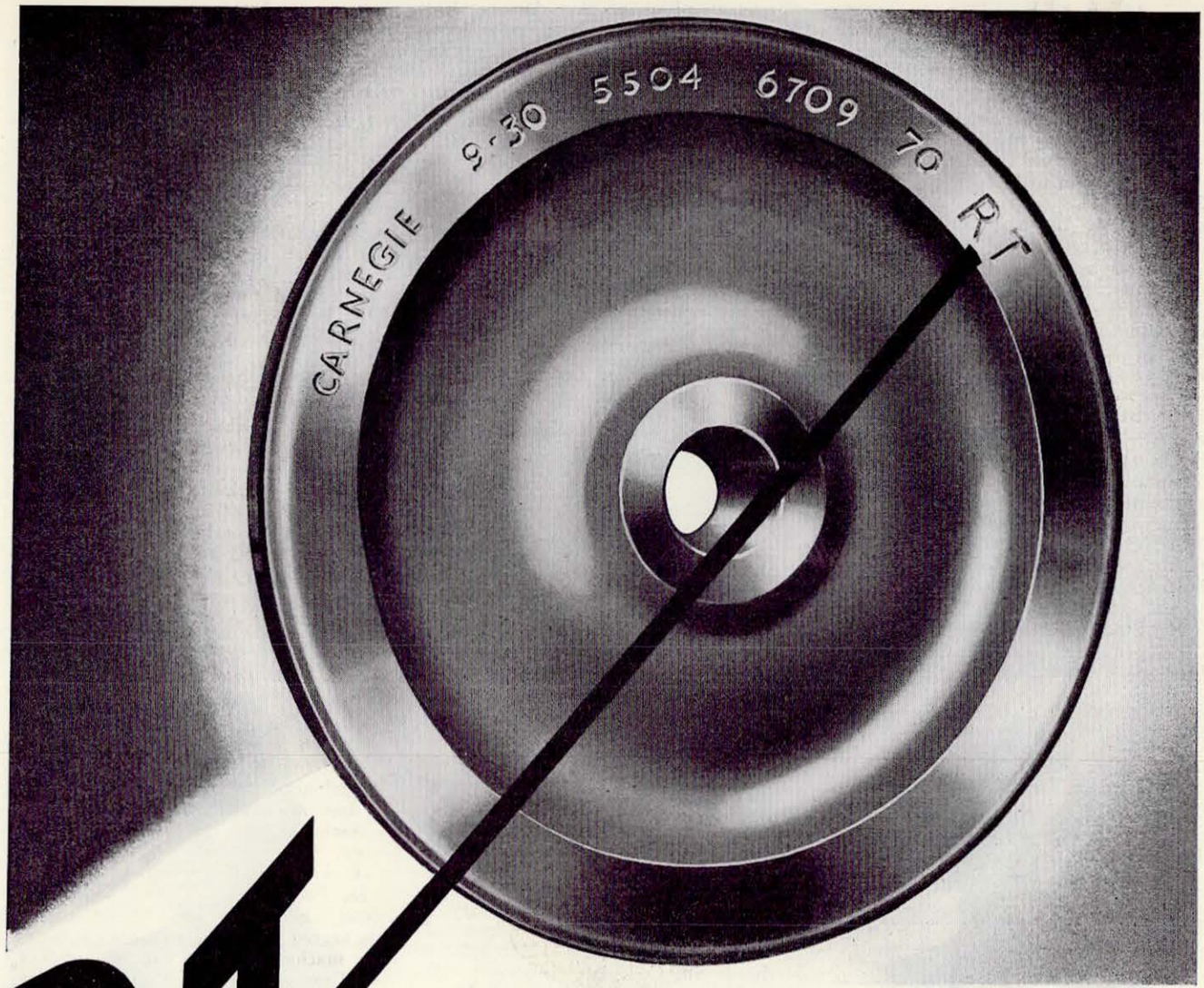

RT . . . the Mark of EXTRA SERVICE

The ever-increasing weight and speed of modern transportation throw a tremendous burden on equipment, particularly on wheels. To meet this condition, we are now prepared to furnish special heat treated wrought steel wheels for passenger, engine truck and locomotive tender service; also heat treated wheels for electric railway service, and single and double flanged crane wheels. The process of heat treatment, varying for different types of service, produces a wheel with an especially tough rim and with high physical properties—a wheel that is highly resistant to wear.

"R T" stamped on your wheels means Rim-Toughened. It indicates the additional refinement of heat treatment. It is the mark of extra service—of extra stamina to endure the heavy loads of present-day transportation.

Our wheel engineers are at your service.

CARNEGIE WROUGHT STEEL WHEELS

Product of Carnegie Steel Company, Pittsburgh, Pa. U.S. STEEL *Subsidiary of United States Steel Corporation* 115

Pa., and on May 1, 1923, he became general superintendent of motive power of the Central region at Pittsburgh. Mr. Hankins attained his position as chief of motive power of the entire system on March 1, 1927, and will continue in that capacity in addition to serving as assistant vice-president, operation.

Mr. Franklin was born at Ashland, Md., in 1884, and received his higher education at Harvard University. He entered the service of the Pennsylvania in 1906 as a clerk in the transportation department. After successive promotions in the freight department, he became southern freight agent at Atlanta, Ga., in January, 1914, and was furloughed for military duty in 1917, serving as major and later lieutenant colonel in the transportation corps of the A. E. F. At the close of the war Mr. Franklin became president of the American Trading Company in New York, later returning to the service of the Pennsylvania as general agent at Detroit. In 1929, he became president of the Detroit, Toledo & Ironton and remained in that position until the time of the present appointment.

Mr. Stackpole was born at Hamilton, N. Y., in 1885, and is a graduate of Harvard University. He entered rail-

S. T. Stackpole

way service in 1907 on the Pennsylvania. After advancing through a number of minor positions Mr. Stackpole was promoted to division freight agent at Detroit, Mich., in 1922. In 1925 he was promoted to assistant general freight agent, with headquarters at the same point, becoming general agent at Detroit in 1927. Mr. Stackpole became traffic manager of the Western region on June 27, 1928, the position he held at the time of his recent promotion.

M. Wardrop was born at Edgeworth, Pa., on January 8, 1879, and entered the service of the Pennsylvania on July 7, 1898, as a yard clerk at Allegheny, Pa. For a short time in 1902 he served as a paymaster's clerk in the treasury department and was then appointed assistant trainmaster of the Erie & Ashtabula division at New Castel, Pa. In 1905, Mr. Wardrop was promoted to trainmaster and in 1911 he was further promoted to superintendent of the Western division at Fort Wayne, Ind. Four years later he was transferred to the Erie & Ashtabula division and in 1920 he was promoted to general superintendent of the Michigan division. In July, 1922, Mr. Wardrop was transferred to the Southern division at Wilmington, Del., his promotion to assistant vice-

W. M. Wardrop

president and general agent at Detroit becoming effective on June 16, 1929.

FINANCIAL, LEGAL AND ACCOUNTING

Wilbur R. Patterson, auditor of disbursements of the Canadian Pacific, has been promoted to deputy general auditor with headquarters at Montreal, Que. Mr. Patterson was born on January 3, 1890, at Toronto, Ont., and received his education at the Matriculated Harbord St. Collegiate Institute. He entered railroad service with the Cana-

Wilbur R. Patterson

dian Pacific on June 5, 1913, and from that date until January 31, 1922, he held various minor positions in the office of the auditor of disbursements. On the latter date he was appointed chief clerk to the auditor of disbursements, and on May 12, 1925, he became assistant auditor of disbursements. On October 1, 1926, he was promoted to auditor of disbursements, the position he held at the time of his recent promotion.

OPERATING

L. U. Morris, who has been promoted to assistant general manager of the Northern district of the Southern Pacific, with headquarters at Sacramento, Cal., was born at Winfield, Kan., on November 7, 1873. He entered railway service at the age of 15 years as an office boy in the office of the superintendent on the Atchison, Topeka & Santa Fe at San Marcial, N. M. Later he was advanced successively through the positions of telegraph operator, station agent, brakeman, conductor and trainmaster, and division superintendent at Wellington, Kan. In 1905, Mr. Morris left the service of the Santa Fe to become division superintendent on the El Paso & Southwestern (now part of the Southern Pacific), being promoted to general superintendent in 1915. Soon after the El Paso & Southwestern was absorbed by the Southern Pacific, in 1925, he was appointed superintendent of the Los Angeles division of the latter road at Los Angeles, Cal. His

L. U. Morris

promotion to general manager of the Northern district became effective on January 1.

PURCHASES AND STORES

H. V. Garza has been appointed purchasing agent of the National Railways of Mexico, with headquarters in Mexico, D. F.

J. E. Candelas, assistant general purchasing agent of the National of Mexico, has been appointed superintendent of stores, with headquarters as before at Mexico, D. F.

TRAFFIC

Frank A. Murphy, general agent of the Maine Central at Presque Isle, Me., has been assigned a similar position at New York, and **Carl C. Haynes,** gen-

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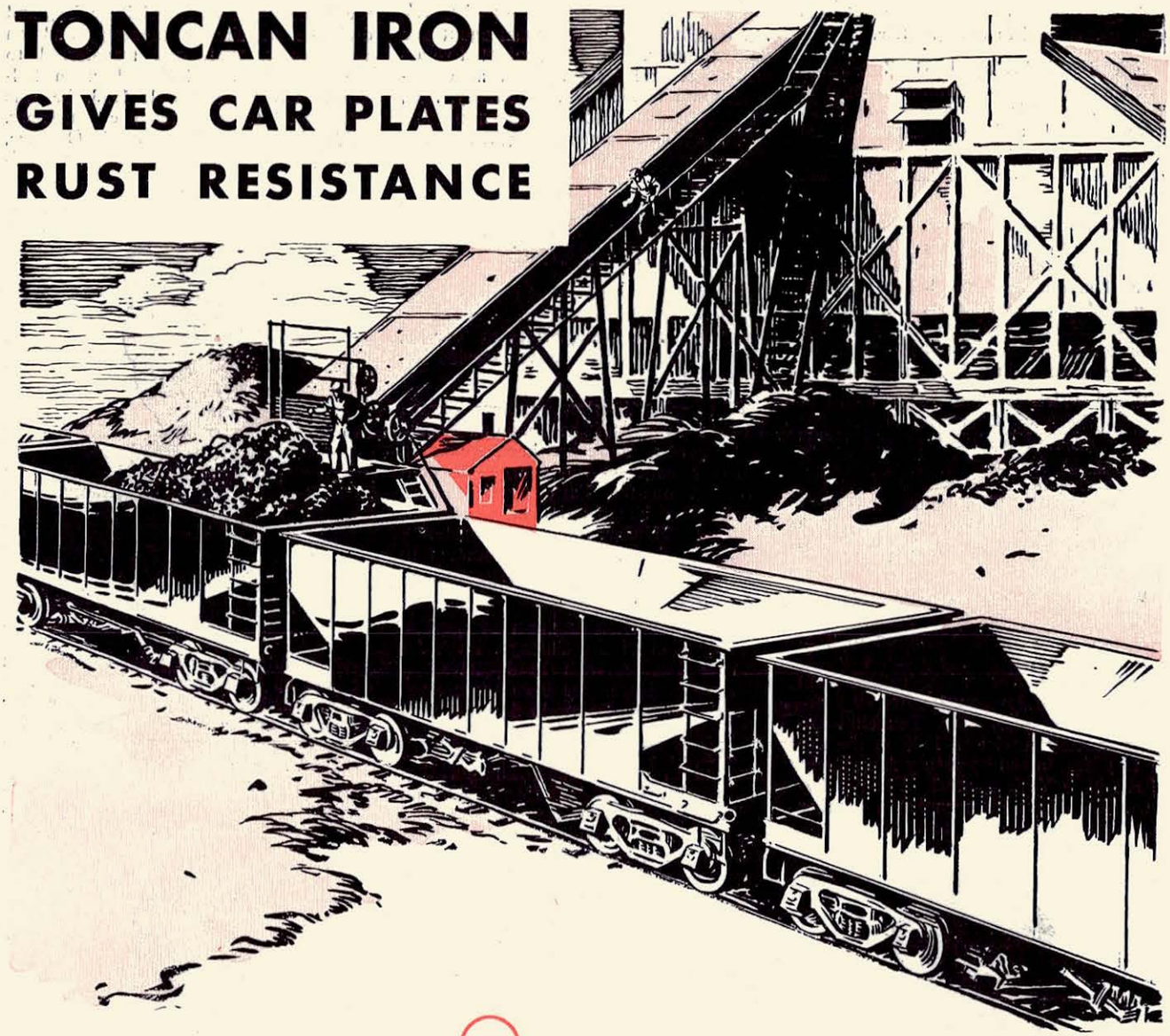
TONCAN IRON GIVES CAR PLATES RUST RESISTANCE



ORDINARY car plates quickly fall a prey to rust and corrosion.

In designing freight cars, plates are made thicker so that rust will take longer to weaken the structure.

But now that modern metallurgy has made available car plates of Toncan Iron—the iron that resists the inroads of rust and corrosion, such procedure is unnecessary.

Rusting is checked by Toncan Iron composition rather than by mere bulk of metal.

A ton of weight can be saved in the average gondola. Or, by using the same thickness of plate in Toncan Iron, the life of the car can be substantially prolonged and maintenance reduced.

Toncan Iron car plates are now in service on many miles of freight cars.

REG. U. S. PAT. OFF.
TONCAN
COPPER
Mo-lyb-den-um
IRON

REPUBLIC STEEL CORPORATION

Youngstown, Ohio

eral agent at Northern Maine Jct. has been transferred to Presque Isle.

Effective February 1, **G. Z. Phillips** will become passenger traffic manager of the Seaboard Air Line succeeding **C. B. Ryan,** retired, and the position of assistant passenger traffic manager now occupied by Mr. Phillips will be abolished.

L. A. Sackbauer, assistant coal traffic manager of the Missouri Pacific, has been promoted to coal traffic manager, with headquarters as before at St. Louis, Mo., succeeding **W. I. Jones,** deceased. **H. E. Taylor,** coal agent, has been promoted to assistant coal traffic manager, succeeding Mr. Sackbauer.

R. W. Wirt, division freight agent of the Southern at Charlotte, N. C., has been appointed assistant freight traffic manager at Jacksonville, Fla., succeeding **Charles M. Tyler** who died on December 27. **W. H. Bondurant,** district freight agent at Philadelphia, has been appointed to succeed Mr. Wirt as division freight agent.

W. T. Tannehill, assistant general freight agent on the New York Central at Chicago, has been promoted to general freight agent at that point, succeeding **William J. Keller,** who retired from active duty on January 1, after 49 years of railway service. Mr. Tannehill entered railway service in 1906, at the age of 15 years, in the operating department of the New York Central. For the following 14 years he occupied a number of minor positions in that department,

W. T. Tannehill

becoming chief clerk to the division freight agent at Kankakee, Ill., in 1920. Three years later he was advanced to chief clerk to the freight traffic manager at Chicago and in 1928 he was appointed chief of the tariff bureau at that point. In 1929 Mr. Tannehill was promoted to assistant to the traffic manager at New York, being further promoted to assistant general freight agent at Chicago in October, 1930, a position he held until his promotion to general freight agent. Mr. Keller entered railway service in 1881 on the New York Central at La Porte, Ind. After occupying various positions in the traffic department he was advanced through the positions of traveling freight agent, commercial agent and general agent. He was promoted to assistant general freight agent at Cleveland, Ohio, in 1923, and in January, 1927, he was transferred to Chicago. Mr. Keller had been general freight agent at Chicago since June, 1928.

ENGINEERING AND SIGNALING

Larsen Brown, assistant system signal engineer of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, Kan., retired from active service on January 1.

T. Martin, division engineer of the Portage division of the Canadian Pacific at Winnipeg, Man., has been appointed assistant engineer in charge of construction on the False Creek-Burrard Inlet tunnel construction at Vancouver, B. C. **V. H. Carruthers,** roadmaster at Weyburn, Sask., has been promoted to division engineer of the Portage division succeeding Mr. Martin.

F. Kirk, division engineer of the Dakota division of the Chicago, Rock Island & Pacific, with headquarters at Estherville, Iowa, has been transferred to the Nebraska-Colorado division, with headquarters at Fairbury, Neb., succeeding **T. P. Warren,** who has been assigned to other duties. The jurisdiction of **W. E. Heimerdinger,** division engineer of the Cedar Rapids-Minnesota division, with headquarters at Cedar Rapids, Iowa, has been extended to include the entire Dakota division. **C. P. Richardson,** engineer of track elevation, with headquarters at Chicago, has also been appointed division engineer of the Chicago Terminal division, succeeding **D. Ruhl,** who has been assigned to other duties. **S. L. McClanahan,** trainmaster at Chickasha, Okla., has been appointed division engineer of the Arkansas-Louisiana division, with headquarters at Little Rock, Ark., succeeding **F. P. Funda,** who has been assigned to other duties.

Effective January 1, as announced in the *Railway Age* of January 17, **E. E. Oviatt,** engineer, maintenance of way, of the New York, New Haven & Hartford, was promoted to chief engineer and **A. L. Bartlett,** maintenance engineer was appointed to succeed Mr. Oviatt as engineer, maintenance of way. **W. T. Dorrance,** designing engineer, was advanced to assistant to chief engineer.

Mr. Oviatt was born on July 13, 1891, and graduated from Sheffield Scientific School of Yale University in 1913 with the degree of C.E. He came to the New Haven in September of that year as a rodman, and later became transitman. On April 30, 1915, he was made assistant engineer, valuation. The following year he was appointed assistant engineer of the Midland division, on May 20, 1917, track supervisor, Boston division, and on April 1, 1918, was promoted to division engineer of the Old Colony division. On January 16, 1920, he went to the Danbury and Central New England divisions in similar capacity, and on February 1, 1921, was transferred to the New Haven and New London divisions. On December 1, 1923, he was promoted to maintenance engineer, holding that position until October, 1929, when he was promoted to engineer, maintenance of way, the position he held up to his present promotion.

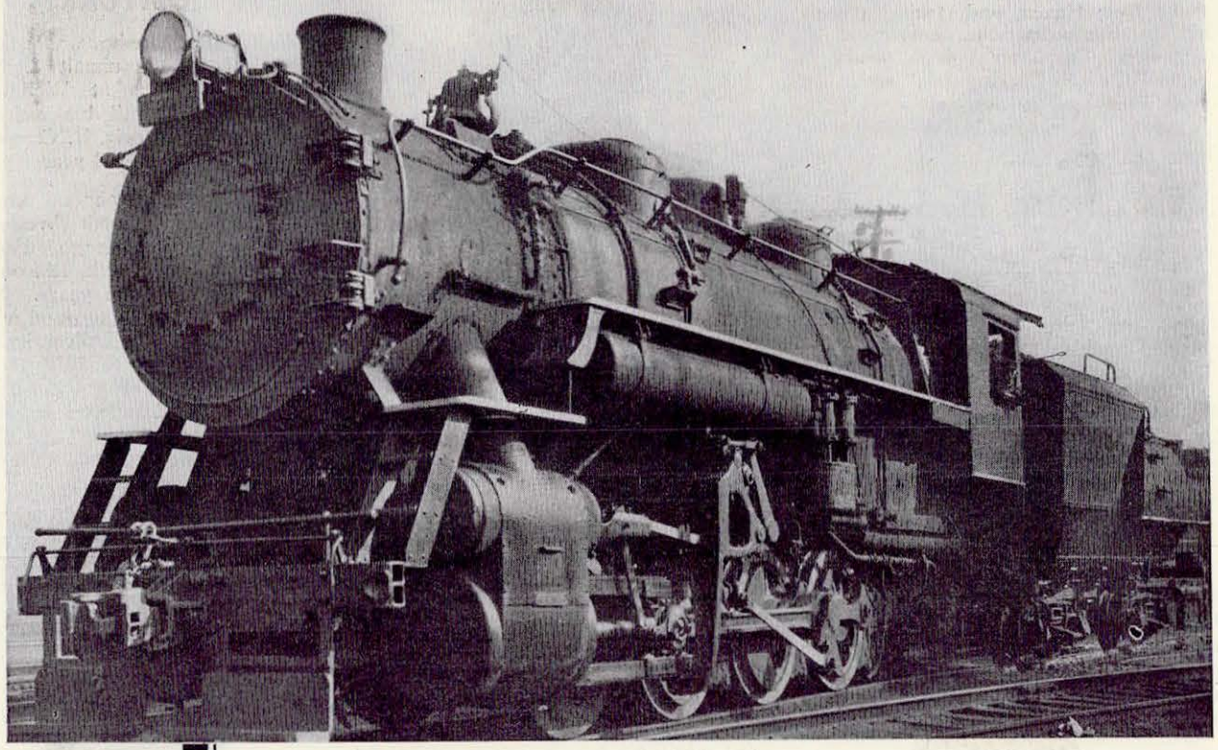
E. E. Oviatt

Mr. Bartlett was born on November 22, 1884, and entered railroad service with the Northern Pacific as trasitman in 1909. In 1910, he went with the United States engineering department, remaining there until January, 1912, when he entered the service of the New Haven as transitman. Two years later he was promoted to assistant engineer at New Haven, Conn,; in 1916, he became general foreman at Saybrook, Conn., and later the same year track supervisor at Providence, R. I. In 1917, he entered war service as a captain in the U. S. Army Engineers, returning to railroad service in June, 1919, as assistant division engineer of the Danbury division. In 1923, he was appointed division engineer of the Boston division, remaining there until November 1, 1928, when he was appointed division engineer of the New Haven division. He was appointed maintenance engineer,

A. L. Bartlett

Continued on Next Left Hand Page

OPERATING EFFICIENCY



of switch engines is oftentimes overlooked in the rush of other matters—but it is a matter of fact that FIREBARS permit not only twenty-four hour operation without fire cleaning—just a little shaking is all that is required. They go for 30 days with the same fires. It must be

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his previous position, in October, 1929.

Mr. Dorrance is a graduate of Brown and Massachusetts Institute of Technology, and his first position in the railroad field was as rodman on the South Station construction work in Boston, Mass. He subsequently served with the Buffalo, Rochester & Pittsburgh and the New York Central lines, on the Long Island electrification, and with the East Boston Company, a terminal railroad project. In 1915, he entered the service of the New Haven, undertaking a position in the valuation department at

W. T. Dorrance

Boston. In July, 1916, he was transferred to New Haven, Conn., as chief draftsman in the engineering department, and in 1920, he was appointed designing engineer, the position he held up to his present promotion.

MECHANICAL

A. V. Birch, master mechanic of the Chicago Terminal division of the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Schiller Park, Ill., has retired from active duty after 43 years of service on the Wisconsin Central and its successor, the Soo Line.

George Whiteley, assistant superintendent of motive power, eastern lines, of the Canadian Pacific, has been appointed superintendent of motive power succeeding **Robert Preston,** retired. **Alexander Peers,** master mechanic of the British Columbia district, has been promoted to succeed Mr. Whiteley as assistant superintendent of motive power at Montreal.

William S. H. Hamilton, who became assistant electrical engineer of the New York Central on January 1, was born on December 31, 1890, at New Haven, Conn., and received his higher education at Sheffield Scientific School, Yale University. In 1911, he became connected with the General Electric Company at Schenectady, N. Y., and held a position in the testing department of that company until 1913, when he was promoted to designing engineer. From 1916 to 1917, he was field engineer and during that period he also served as instructor to enginemen, etc., when the first electrification on the C. M. & St. P. was opened. In 1917, he became designing engineer, the position he held until 1918, when he enrolled for service in the U. S. Navy. During the period he was engaged in that service he was

William S. H. Hamilton

ensign and part of the time he was engineering officer, U. S. S. Henderson. He returned to the General Electric Company in 1919 as field engineer, and during the period from 1922 to 1924, he was designing engineer, locomotive department. From 1925 to 1927, he was commercial engineer, railway engineering department, and from 1928 up to January 1, 1931, he served as electrification specialist of the General Electric Company at New York.

William R. Wood, who has been promoted to assistant general superintendent of motive power of the Great Northern, with headquarters at St. Paul, Minn., has been connected with that railroad for 29 years. He was born at St. Paul on July 26, 1877, and graduated from the University of Minnesota in

William R. Wood

1901. In the same year he entered railway service as a mechanical draftsman on the Great Northern, later being advanced to an inspectorship. Mr. Wood was promoted to superintendent of shops at Barnesville, Minn., in 1905, being appointed superintendent of car shops at St. Paul in 1906. In 1910 he was advanced to engineer of tests, with headquarters at St. Paul, and five years later he became mechanical valuation engineer, with headquarters at the same point. Early in 1917 he was promoted to mechanical engineer, with headquarters at St. Paul, a position he held until his promotion to assistant general superintendent of motive power.

OBITUARY

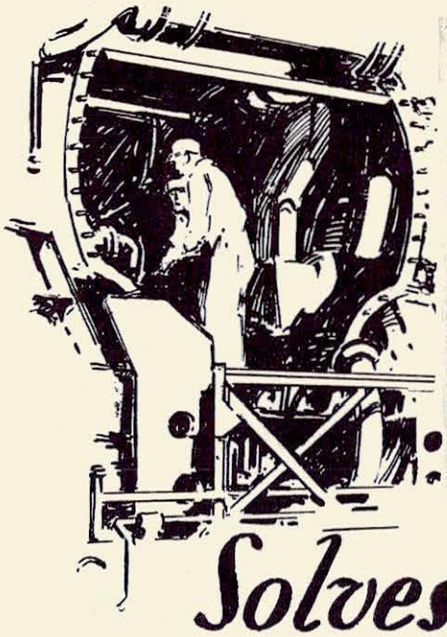
Walter Byrd, who was master mechanic of the Esquimalt & Manaimo, with headquarters at Wellington, B. C., from 1918 until his retirement in 1928, died at Victoria, B. C., on December 1 at the age of 70 years.

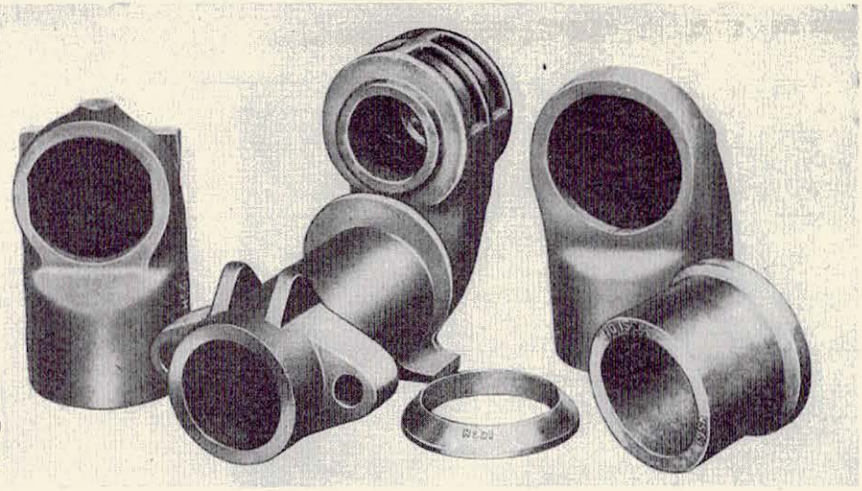
Edgar R. Hart, general attorney of the Chicago & North Western, with headquarters at Chicago, died at his home at Madison Park, Ill., on January 17, at the age of 56 years. Mr. Hart was a native of Chicago and a graduate of Northwestern University. After serving from 1907 to 1912 as assistant corporation counsel of the City of Chicago, he entered railroad service as assistant Nebraska attorney for the North Western. Two years later he was promoted to general attorney.

George E. Evans, executive vice-president of the Louisville & Nashville, with headquarters at Louisville, Ky., who died on January 7, had been in

G. E. Evans

railway service for nearly 60 years. He was born at Cambridge, Ohio, on May 2, 1856, and entered railway service at the age of 15 years as a telegraph operator on the Baltimore & Ohio at that point. Mr. Evans became a telegraph operator on the Louisville & Nashville at the age of 17, and was then successively advanced through the positions of chief operator, train dispatcher, master of trains and superintendent on the Louisville division. In May, 1887, he was promoted to superintendent of transportation and in July, 1900, he became general manager. Five years later he was elected vice-president in charge of operation, being elected executive vice-president of the Louisville & Nashville in February, 1926.





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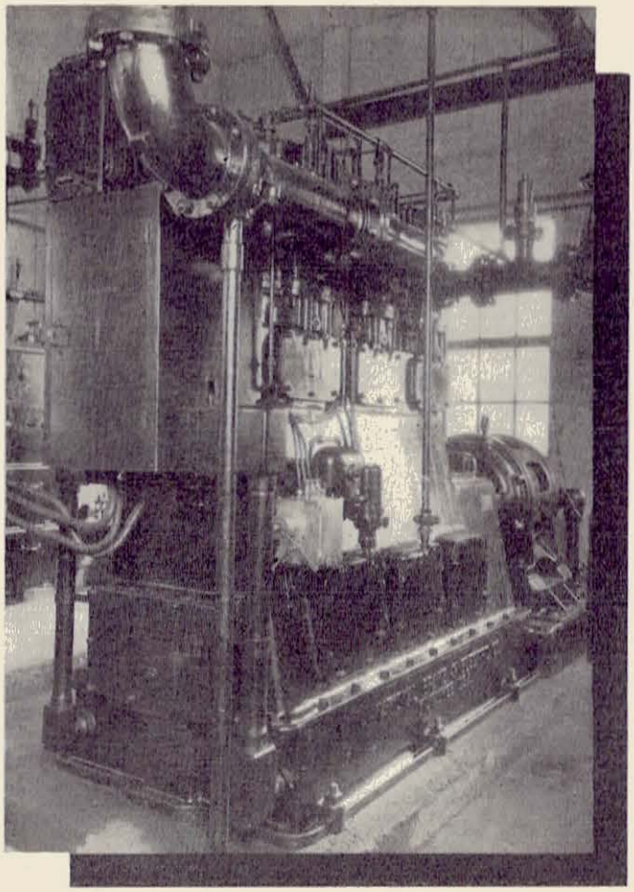

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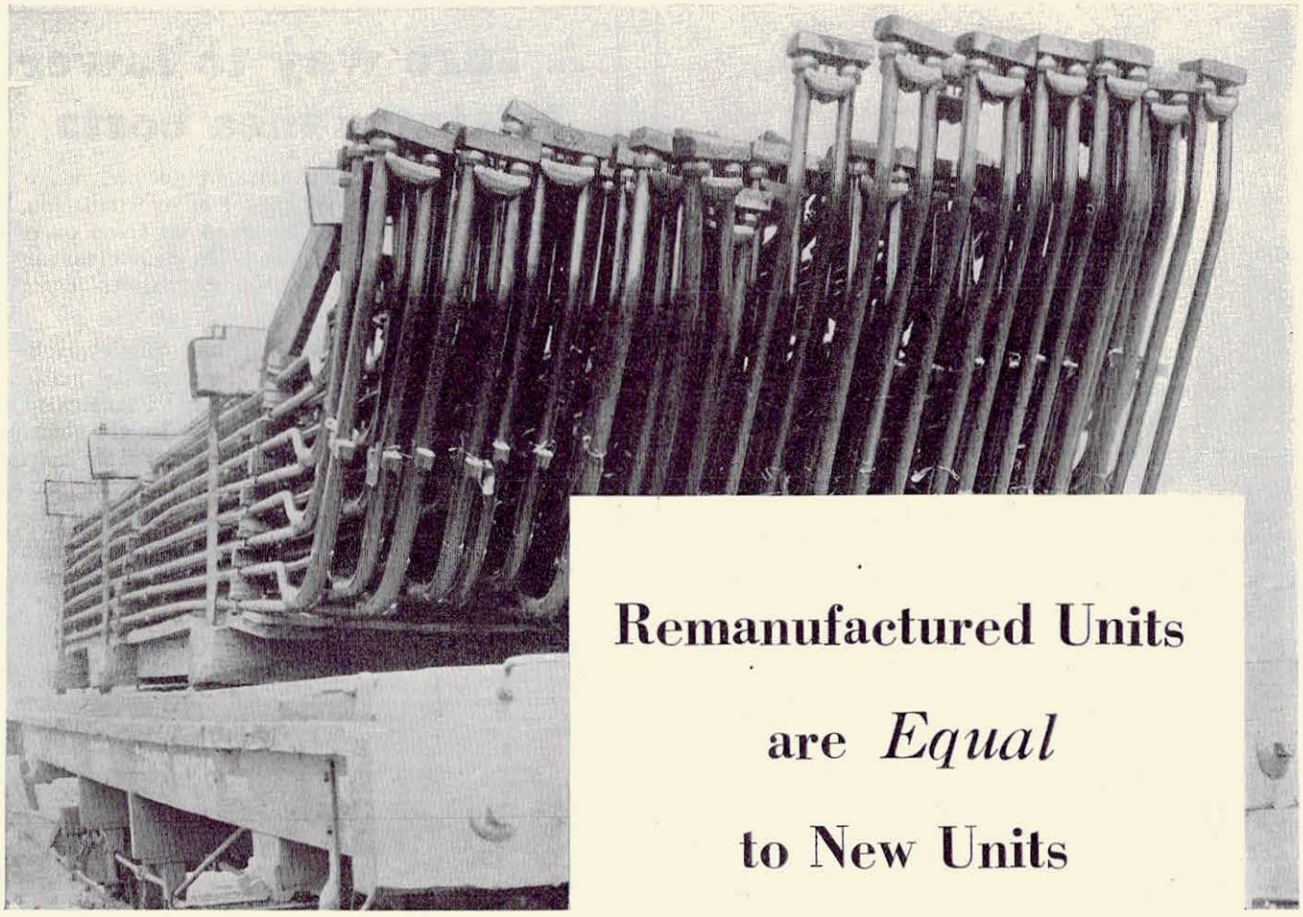

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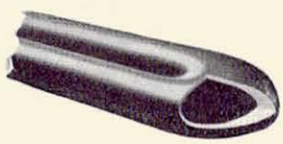
A Set of Remanufactured Superheater Units Being Returned to a Railroad



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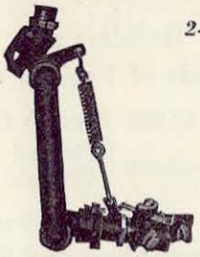

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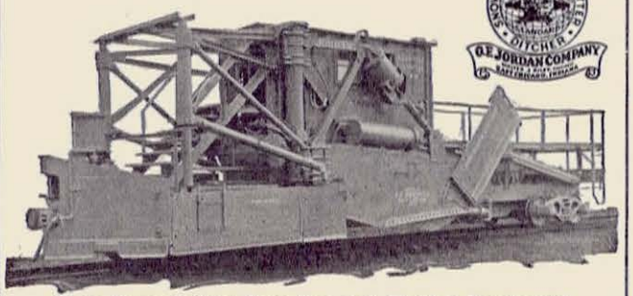

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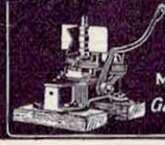
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Industrial Brownhoist Corp.

Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Ash Pans, Cast Steel.
General Steel Castings Corp.

Auxiliary Locomotive.
Bethlehem Steel Company.

Axles, Car and Locomotive.
American Locomotive Co.
Baldwin Locomotive Works
Bethlehem Steel Corp.
Carnegie Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Midvale Co., The
National Railway Appliance Co.
Standard Steel Works Co.

Axles, Mine Car.
Brill Co., The J. G.
Mt. Vernon Car Mfg. Co.

Axles, Motor Trucks.
Timken-Detroit Axle Co.

Babbitt Metal.
National Bearing Metals Corp.
Ryerson & Son, Inc., Jos. T.
Westinghouse Elec. & Mfg. Co.

Baggage Door Controller Device.
Edwards Co., O. M.

Barges, Steel.
American Bridge Co.

Bars, Concrete, Reinforcing.
Carnegie Steel Co.
Central Alloy Steel Corp.
Illinois Steel Co.
Inland Steel Co.
Interstate Iron & Steel Co.
Ryerson & Son, Joseph T.

Bars, Iron and Steel.
Carnegie Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Illinois Steel Co.
Inland Steel Company.
Interstate Iron & Steel Co.
Lockhart Iron & Steel Co.
McConway & Torley Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Bars, Rolled Steel.
Carnegie Steel Co.

Batteries, Lighting.
Electric Storage Battery Co.

Batteries, Starting.
Electric Storage Battery Co.

Batteries, Storage.
Electric Storage Battery Co.
Railroad Supply Co.
Safety Car Heating & Lighting Co.

Batteries, Wet Cell.
Electric Storage Battery Co.

Beams, Channel & Angle.
Carnegie Steel Co.
Illinois Steel Co.

Bearings, Axle Generator.
S. K. F. Industries, Inc.
Westinghouse Elec. & Mfg. Co.

Bearings, Ball Thrust.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The

Bearings, Center.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Miner, W. H.
Pressed Steel Car Co.
Stucki Co., A.
Symington Co., The.

Bearings, Journal.
Fafnir Bearing Co.
Magnus Co., Inc.
National Bearing Metals Corp.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The

Bearings, Journal Roller.
Fafnir Bearing Co.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The

Bearings, Roller.
American Steel Foundries Co.
Fafnir Bearing Co.
Hyatt Roller Bearing Co.
Miner, W. H.
Shafer Bearing Corp'n.
S. K. F. Industries, Inc.
Standard Car Truck Co
Stucki Co., A.
Timken Roller Bearing Co..
Wine Railway Appliance Co.

Bearings, Roller Side.
Q. & C. Company, The
Standard Coupler Co.

Bearings, Side.
American Steel Foundries.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
Standard Car Truck Co.
Wine Railway Appliance Co.

Beds, Cast Steel, Locomotive.
General Steel Castings Corp.

Bell Ringer, Locomotive.
Ardco Mfg. Co.
Prime Mfg. Co., The

Bells, Highway Crossing.
Railroad Supply Co.

Belt Lacing Machines.
Birdsboro Steel Foundry & Mach. Co.

Benders, Rail.
Q & C Co., The

Bending and Straightening Machines.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Billets, Steel.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Interstate Iron & Steel Co.
McConway & Torley Co.
Midvale Co., The
Ryerson & Son, Jos. T.
Republic Steel Corp.
Standard Steel Works Co.

Blocks, Chain.
Barco Mfg. Co.
Yale & Towne Manufacturing Co.

Blocks, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison-Wright Co.

Blooms, Steel.
Carnegie Steel Co.
Republic Steel Corp.
Interstate Iron & Steel Co.

Blow Pipe Systems, Pneumatic.
Mahon Co., R. C.

Blower Fittings, Automatic Smokebox.
Barco Mfg. Co.

Blowers, Soot.
Rees Mfg. Co.

Blowers, Turbo.
Ingersoll-Rand Co.

Blow Off Line Joints, Roundhouse—(See Joints, etc.)

Blowtorches, Acetylene.
Oxweld Railroad Service Co., The

Boiler Checks.
Prime Manufacturing Co., The

Boilers, Locomotive.
American Locomotive Co.
Baldwin Locomotive Works
Lima Locomotive Works.

Boilers, Scale Proof.
Industrial Brownhoist Corp.

Bolsters, Steel.
American Steel Foundries.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Gould Coupler Co., The
Mt. Vernon Car Mfg. Co.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Symington & Son, Inc., T. H.

Bolsters, Steel.
Ohio Steel Foundry Co., The.

Bolts and Nuts.
Bethlehem Steel Co.
Buffalo Brake Beam Co.
Dardelet Threadlock Corp.
Neely Nut & Bolt Co.
Russell, Burdsall & Ward Bolt and Nut Co.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Bolts & Nuts, Monel Metal.
International Nickel Co., The.

Bolts, Patch.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Bolts, Track.
Illinois Steel Co.
Inland Iron & Steel Co.

Bonders, Rail.
Q & C Co., The.

Bonding Rail Outfits.
Ingersoll-Rand Co.

Bonds, Rail.
American Steel & Wire Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Bonds, Signal.
American Steel & Wire Co.
General Cable Corp.
Railroad Supply Co.

Bond Wire Protection.
P & M Co., The

Boosters, Locomotives.
Franklin Railway Supply Co., Inc.

Boring & Drilling Machines, Horizontal.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Boring Machines, Car Wheel.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Horizontal.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Vertical.
Sellers & Co., Inc., Wm.

Braces, Rail.
Bettendorf Co., The
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
Q. & C. Co., The.
Ramapo Ajax Co.
Symington Co., The.

Brake Beam Safety Guards.
Chicago Railway Equipment Co.

Brake Beam Supports.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Davis Brake Beam Co.

Brake Beams.
American Steel Foundries.
Bradford Corporation.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Davis Brake Beam Co.
Hunt-Spiller Mfg. Corp.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.

Brake Drums.
American Car & Foundry Motors Co.
Hunt-Spiller Mfg. Corp.

Brake Forgings, Pins, Levers, etc.
American Steel Foundries.
Brill Co., The J. G.
Davis Brake Beam Co.
Mt. Vernon Car Mfg. Co
Schaefer Equipment Co

Brakes, Hand.
National Brake Co.

Brake Heads.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Davis Brake Beam Co.
Pressed Steel Car Co.

Brake Jaws.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.
Steel Car Forge Co.

Brake Shoes.
American Brake Shoe & Foundry Co.
American Steel Foundries.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Fort Pitt Malleable Iron Co.
Mt. Vernon Car Mfg. Co.

Brakes, Air.
General Electric Co.
Westinghouse Air Brake Co.

Brakes, Clasp.
American Steel Foundries.

Brakes, Electric.
Westinghouse Air Brake Co.

Brakes, Hand.
Miner, W. H.
National Brake Co.
National Malleable & Steel Castings Co.
Wine Railway Appliance Co.

Brass, Sash.
Edwards Co., O. M.

Brick, Locomotive Arch.
American Arch Co.

Bridge Builders.
American Bridge Co.
Bethlehem Steel Company.

Bridge Floors.
Armco Culvert Mfrs. Assoc.

Bridge & Crossing Plank, Creosoted.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Flooring.
Carey Co., The, Philip.

Bridge Material.
International Creosoting & Construction Co.

Bridge Material, Creosoted.
National Lumber & Creosoting Co.

Bridge Stringers — (See Stringers, Bridge).

Bronze Powder, Aluminum.
Aluminum Co. of America.

Bucket Handling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.

Buckets, Grab.
American Bridge Co.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Buckets, Self-Dumping.
Whiting Corporation.

Buffers, Friction.
Edgewater Steel Co.
Miner, W. H.
Standard Coupler Co.
Waugh Equipment Co.
Westinghouse Air Brake Co.

Buffers, Radial.
Franklin Railway Supply Co., Inc.

Building Materials.
Carey & Co., Philip, The.
Johns-Manville Corp.

Buildings, Iron, Steel & Steel Concrete.
American Bridge Co.
United Engineers & Constructors, Inc.

Bulldozers.
Ryerson & Son, Joseph T.

Bushings, Grease Cup.
Prime Mfg. Co., The.

Cable Accessories, Electrical.
General Cable Corp.
Graybar Electric Co.

Cables, Electric.
American Steel & Wire Co.
General Cable Corp.
General Electric Co.
Graybar Electric Co.
Ketrie Insulated Wire & Cable Co.
Okonite Co., The.

Cableways—(See Tramways)

Caps, Grease.
Prime Mfg. Co., The.

Carbide Calcium.
Oxweld Railroad Co., The
Union Carbide Sales Co.

Car Insulation.
Carey & Co., Philip, The.

Car Lighting Equipment—(See Lighting Car Equipment).

Carlines.
Hutchins Car Rfg. Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Car Material, Wood.
Central Coal & Coke Co.

Car Parts and Appliances.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Car Parts, Freight.
Bettendorf Co., The.
Pressed Steel Car Co.

Car Parts, Passenger.
Brill Co., The J. G.
St. Louis Car Co.

Car Repairs.
Pressed Steel Car Co.
St. Louis Car Co.
Tennessee Coal, Iron & Railroad Co.

Car Retarder Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Car Siding (See Siding Car, etc.)

Car Washers.
Whiting Corporation.

Car Washers and Scrubbers Combined.
Whiting Corporation.

Cars, Baggage.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Cars, Ballast.
Bethlehem Steel Company.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Caboose, Coal & Stock.
Mt. Vernon Car Mfg. Co.

Cars, Convertible.
Mt. Vernon Car Mfg. Co.

Cars, Dump.
Bethlehem Steel Company.
Bettendorf Co., The
Differential Steel Car Co.
Magor Car Corporation.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Flat, Narrow Gauge.
Bettendorf Co., The.
Western Wheeled Scraper Co.

Cars, Freight.
Bethlehem Steel Co.
Bettendorf Co., The
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Co.

Cars, Freight (New and Repaired).
Bethlehem Steel Company.
Bettendorf Co., The.
Pressed Steel Car Co.

Cars, Gasoline-Electric.
Brill Co., The J. G.
Electro-Motive Co.
St. Louis Car Co.

Cars, Gasoline Motor.
Brill Co., The J. G.
St. Louis Car Co.

Cars, Hand & Push.
Fairbanks-Morse & Co.

Cars, Industrial.
Bethlehem Steel Company.
Brill Co., The J. G.
Pressed Steel Car Co.
Western Wheeled Scraper Co.
Whiting Corporation.

Cars, Motor.
Fairbanks-Morse & Co.

Cars, Motor Inspection.
Fairbanks-Morse & Co.

Cars, Oil Electric.
Westinghouse Elec. & Mfg. Co.

Cars, Ore.
Brill Co., The J. G.
Pressed Steel Car Co.

Cars, Passenger.
Bethlehem Steel Company.
Brill Co., The J. G.
Electro Motive Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.
St. Louis Car Co.

Cars, Power Units.
Brill Co., The J. G.
Electro Motive Co.

Cars, Quarry.
Western Wheeled Scraper Co.

Cars, Rebuilt and Repaired.
Bettendorf Co., The
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Refrigerator.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Cars, Second-Hand.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Self-Propelled Passenger.
Brill Co., The J. G.
Electro Motive Co.
General Electric Co.
Pullman Car & Mfg. Corp.
Westinghouse Elec. & Mfg. Co.

Cars, Spreader.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Cars, Tank.
Bethlehem Steel Company.
General American Tank Car Corp.
Pressed Steel Car Co.

Carts, Dump.
Western Wheeled Scraper Co.

Castings, Alloy Steel.
Symington Co., The
Union Spring & Mfg. Co.

Castings, Brass and Bronze.
General Railway Signal Co.
Magnus Co., Inc.
National Bearing Metals Corp.
Union Switch & Signal Co.

Castings, Gray Iron.
American Brake Shoe & Foundry Co.
American Locomotive Co.
Baldwin Locomotive Works
General Railway Signal Co.
Mt. Vernon Car Mfg. Co.
Rampo Ajax Corp.
Union Switch & Signal Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corp.

Castings, Iron & Steel.
Industrial Brownhoist Corp.

Castings, Malleable Iron.
Buckeye Steel Castings Co.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
P & M Company, The.
Pressed Steel Car Co.
Symington Co., The
Universal Draft Gear Attachment Co.

Castings, Monel Metal.
International Nickel Co., The.

Castings, Steel.
Allegheny Steel Co.
American Locomotive Co.
American Steel Foundries.
Bethlehem Steel Co.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach Co.
Buckeye Steel Castings Co.
General Steel Castings Corp.
Gould Coupler Co., The
McConway & Torley Co.
Midvale Co., The.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Steel Casting Co.
Universal Draft Gear Attachment Co.

Castings, Steel Loco.
Birdsboro Steel Foundry & Mach. Co.
General Steel Castings Corp.
Gould Coupler Co., The
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Castings, Steel Vanadium.
Birdsboro Steel Foundry & Mach Co.
Brill Co., The J. G.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Catchbasins, Corrugated Iron.
Armco Culvert Mfrs. Assoc.

Cellers, Engine Truck.
Ardco Mfg. Co.

Cement Car, Asphalt.
Sherwin-Williams Co.

Cement, High Temperature.
Carey Co., Philip, The.
Johns-Manville Corp.

Cements, Asbestos and Magnesia.
Carey Co., Phillip, The.

Center Plates — (See Bearings, Center).

Center Sills.
Bettendorf Co., The.
Bradford Corporation.

Chain Monel Metal.
International Nickel Co. The.

Chemicals.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.

Chemicals, Boiler.
Bird-Archer Co., The.

Chemicals, Cleaning.
Oakite Products, Inc.

Chemists.
Bird-Archer Co., The
Dearborn Chemical Co.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Chromium.
Electro Metallurgical Sales Corp.

Chromium Plating.
Worthington Pump & Machinery Corp.

Chucks, Lathe.
Ryerson & Son, Jos. T.

Cinder Handling Plants.
Roberts & Schaefer Co.

Circuit Breakers.
General Electric Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Clamps, Flanging.
Ryerson & Sons, Jos. T.

Clamps, Guard Rail.
O. & C. Co., The.
Westinghouse Air Brake Co.

Clamps, Hose.
Ingersoll-Rand Co.
National Malleable & Steel Castings Co.
Vapor Car Heating & Lighting Co.
Westinghouse Air Brake Co.

Clamps, Pipe.
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.

Clamps, Rail Cutting.
Oxweld Railroad Service Co., The.

Classification Yard Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Cleaners, Aircraft.
Oakite Products, Inc.

Cleaners, Air Pump.
Oakite Products, Inc.
Westinghouse Air Brake Co.

Cleaners, Bus & Truck.
Oakite Products, Inc.

Cleaners, Car.
Oakite Products, Inc.

Cleaners, Flue.
Ryerson & Son, Jos. T.

Cleaners, General.
Oakite Products, Inc.

Cleaners, Locomotive.
Oakite Products, Inc.

Cleaners, Metal.
Oakite Products, Inc.

Clips, Wire Rope.
American Hoist & Derrick Co.

Coach and Coach Yard Steam Joints—(See Joints, etc.)

Coaches, Motor.
American Car & Foundry Motors Co.
Dodge Motor Truck Corp.
International Harvester Co.
White Co., The.

Coaches, Second-Hand.
Hyman-Michaels Co.

Coal, Ore & Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.
Roberts & Schaefer Co.

Coal Pushers.
Standard Stoker Co.

Coaling Stations.
American Bridge Co.
Fairbanks-Morse & Co.
Roberts & Schaefer Co.

Cocks, Angle.
Westinghouse Air Brake Co.

Cocks, Blow-Off.
Bird-Archer Co., The.

Cocks, Cylinder.
Prime Manufacturing Co., The.

Collecting System, Dust.
Whiting Corporation.

Columns, Water.
Prime Manufacturing Co., The.

Combination Crane Pile Drivers.
Industrial Brownhoist Corp.

Compounds, Boiler.
Dearborn Chemical Co.
Bird-Archer Co., The
General Electric Co.

Compounds, Cleaning.
Oakite Products, Inc.

Compounds, Cutting.
Oakite Products, Inc.

Compounds, Grinding.
Oakite Products, Inc.

Compounds, Paint Removing.
Oakite Products, Inc.

Compounds, Rust Proofing.
Oakite Products, Inc.

Compressors, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Concrete Floor Slabs.
Federal American Cement Tile Co.

Concrete Reinforcement.
American Steel & Wire Co.
Carnegie Steel Co.
Ryerson & Sons, Jos. T.

Concrete Roofing, Tile.
Federal American Cement Tile Co.

Condensers.
Ingersoll-Rand Co.

Condensing Apparatus.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Conduit, Rigid.
Aluminum Co. of America.

Conduits, Metallic Flexible.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Graybar Electric Co.
Vapor Car Heating Co., Inc.

Conduit, Underground.
Graybar Electric Co.
Johns-Manville Corp.

Connections.
Prime Manufacturing Co., The.

Connections, Lever.
National Malleable & Steel Castings Co.

Connections, Truck.
National Malleable & Steel Castings Co.

Connections, Truck Lever.
Schaefer Equipment Co.

Contraction Joint.
General Railway Signal Co.

Control Devices, Train Speed.
Union Switch & Signal Co.

Control, Locomotive.
Valve Pilot Co.

Controllers, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Conveying Machinery.
American Bridge Co.
Clark Tructractor Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Corrugated Sheet.
Aluminum Co. of America.

Conveyor, Ash — (See Coal Ore and Ash Handling Mach.)

Coupler Pockets—(See Draft Yokes.)

Coupler Yokes.
Bettendorf Co., The.
Gould Coupler Co.
Symington Co., The.

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
McConway & Torley Co.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Westinghouse Air Brake Co.

Couplings, Hose.
Fort Pitt Malleable Iron Co.
Ingersoll-Rand Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co

Cranes, Ballast Cleaning.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Barge.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Bracket.
Shephard-Niles Crane & Hoist Corp.
Whiting Corporation.

Cranes, Crawler.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Crawling Shovels and Draglines.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton, Crane & Shovel Co.

Cranes, Diesel.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Electric Traveling.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.

Cranes, Gantry.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.
Shephard-Niles Crane & Hoist Corp.
Whiting Corporation

Cranes, Gasoline.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Grab Bucket.
American Hoist & Derrick Co.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Handpower.
American Hoist & Derrick Co.
Shephard-Niles Crane & Hoist Corp.
Whiting Corporation.

Cranes, Jib.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.
Worthington Pump & Machinery Corp.

Cranes, Locomotive.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Magnet.
Whiting Corporation.

Cranes, Overhead.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Pillar.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.

Cranes, Portable.
American Hoist & Derrick Co.
Clark Tructractor Co.

Orton Crane & Shovel Co.

Cranes, Tractor.
Orton Crane & Shovel Co.

Cranes, Transfer.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.

Cranes, Traveling.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Wharf.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Wrecking.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Crank Pins — (See Pins, Cranks).

Creosote.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison Wright Co.

Cribbing Units.
Federal American Cement Tile Co.

Cross Arms.
American Bridge Co.
General Electric Supply Corp.
Graybar Electric Co.
International Creosoting & Construction Co.

Cross-Over Bridges, Freight House.
Whiting Corporation.

Cross Ties.
Century Wood Preserving Co.
International Creosoting & Construction Co.

Cross Ties, Creosoted.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Cross Ties, Steel.
Bethlehem Steel Co.

Crossheads & Shoes.
Baldwin Locomotive Wks.
Barco Mfg. Co.
International Creosoting & Construction Co.

Crossing Signals & Signs.
Railroad Supply Co.

Crossings — (See Frogs and Crossings).

Crossings, Pavement.
Carey Co., The Philip

Crushers, Coal.
American Sheet & Tin Plate Co.
Orton Crane & Shovel Co.

Culverts.
American Rolling Mill Co., The.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Toncan Culvert Manufacturers' Association.

Culverts Corrugated.
Armco Culvert Manufacturers' Association.
Republic Steel Corp.

Culverts, Paved Invert.
Armco Culvert Mfrs. Assoc.

Cupolas, Foundry.
Whiting Corporation.
Hammett, H. G.

Cups, Oil.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Curtains & Fixtures, Car Window.
Pantasote Co., Inc., The.

Curtain Material, Car.
Ryerson & Son, Jos. T.

Cutting & Welding Apparatus.
Oxweld Railroad Service Co.
Westinghouse Elec. & Mfg. Co.

Cut-Off Indicators & Recorders.
National Tube Co.
Valve Pilot Co.

Cylinders, Air Brake.
Westinghouse Air Brake Co.

Cylinders, Cast Steel Locomotive.
General Steel Castings Corp.
Union Steel Casting Co.

Cylinders, Oxy-Acetylene.
Oxweld Railroad Co., The

Deoxidizers.
Q & C Co., The.
Vanadium Corp. of America.

Derricks.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Diesel Electric Power Plants
Fairbanks-Morse & Co.
Westinghouse Elec. & Mfg. Co.

Dirt Collectors.
Westinghouse Air Brake Co.

Disinfectants.
West Disinfecting Co.

Dispatching Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Ditchers.
American Hoist & Derrick Co.
Jordan Co., O. F.

Ditching Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Door Fixtures—(See Fixtures Car Door).

Doors, Car.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
Wine Railway Appliance Co.

Doors, Folding, Rolling and Sliding.
Kinnear Manufacturing Co.

Doors, Locomotive Firebox.
Franklin Railway Supply Co., Inc.

Doors, Steel.
Kinnear Manufacturing Co.

Doors, Rolling, Steel.
Kinnear Mfg. Co.
Mahon Co., R. C.

Doors, Wood.
Kinnear Mfg. Co.

Draft Arms.
American Steel Foundries.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Symington Co., The.
Universal Draft Gear Attachment Co.

Draft Gear Attachments.
Symington Co., The.

Draft Gears.
American Steel Foundries.
Bradford Corporation.
Cardwell-Westinghouse Co.
Edgewater Steel Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Union Draft Gear Co.
Universal Draft Gear Attachment Co.

Draft, Yokes
American Steel Foundries.
Bettendorf Co., The.
Buckeye Steel Castings Co.
Gould Coupler Co., The
McConway & Torley Co.
Miner, W. H.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Co.
Symington Co., The
Universal Draft Gear Attachment Corp.

Draglines.
Orton Crane & Shovel Co.

Drainage Gates.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Drains, Perforated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Drawbar Centering Device.
Gould Coupler Co., The
Miner, W. H.

Drawbars, Unit Safety.
Franklin Railway Supply Co., Inc.
Industrial Brownhoist Corp.

Dredging Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Drilling Machines.
Sellers & Co., Inc., Wm.

Drilling Machines, Bonding.
Railroad Supply Co.

Drilling Machines, Pneumatic.
Ingersoll-Rand Co.

Drilling Machines, Rock.
General Electric Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drilling Machines, Upright and Radial.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Drills.
Ingersoll-Rand Co.

Drills, Close Corner.
Ingersoll-Rand Co.

Drills, Concrete.
Ingersoll-Rand Co.

Drills, Steel Rock and Steel Sharpened.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Track & Bending.
Bird-Archer Co., The.
Ingersoll-Rand Co.

Drinking Cups.
U. S. Envelope Co.

Drive Gas Electric Coaches.
General Electric Co.

Drive Gas Electric Locomotives
Westinghouse Elec. & Mfg. Co.

Driving Boxes (Extended Main).
Franklin Railway Supply Co., Inc.

Drop Door Mechanism.
Wine Railway Appliance Co.

Drop Trucks, Transformer.
Whiting Corporation.

Drop Tables, Electric.
Whiting Corporation.

Drop Testing Machinery.
Whiting Corporation.

Drying Ovens.
Mahon Co., R. C.

Dynamos — (See Generators Electric).

Electrical Cable Accessories.
General Cable Corp.
General Electric Supply Corp.

Electric Cables.
General Cable Corp.
General Electric Supply Corp.

Electrical Instruments.
Electric Service Supplies. Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Electrical Supplies.
General Electric Co.
General Electric Supply Corp.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Electrification, Railroad.
Battey & Kipp.
General Electric Co.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Electric Heaters.
General Electric Supply Corp.

Electrical Insulation.
General Cable Corp.
General Electric Supply Corp.

Electrical Porcelain Insulators.
General Electric Supply Corp.

Electric Motors.
General Electric Supply Corp.

Electric Rivet Heaters.
General Electric Supply Corp.

Electric Switches.
General Electric Supply Corp.

Enamels.
Sherwin-Williams Co.

End Frames, Cast Steel, Passenger Car
General Steel Castings Corp.

Ends, Steel.
Hutchins Car Rfg. Co.
Union Metal Products Co.

Engineers, Consulting, Civil, Elec., Hydraulic, Mechanical.
Battey & Kipp.
Hunt Co., Robt. W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Contracting.
Battey & Kipp.
United Engineers & Constructors, Inc.

Engineers and Contractors.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Construction.
Battey & Kipp.
Roberts & Schaefer Co.
United Engineers & Constructors, Inc.

Engineers and Contractors, Elec. Hydraulic, Mech.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
Roberts & Schaefer Co.

Engineers, Inspecting.
Gulick-Henderson Co.
Hunt Co., Robert W.
Muhlfeld, John E.
Pittsburgh Testing Laboratory.
United Engineers & Constructors, Inc.

Engineers, Valuation.
Hunt Co., Robert W.
United Engineers & Constructors, Inc.

Engines, Crude & Fuel Oil.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Diesel.
Worthington Pump & Machinery Corp.

Engines, Gas.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Engines, Gas & Gasoline.
American Car & Foundry Motors Co.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Hoisting.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Envelopes.
U. S. Envelope Co.

Excavators.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Exhaust & Heater Pipe.
Union Asbestos & Rubber Co.

Exhaust & Ventilating Fans.
General Electric Supply Corp.

Expanders, Tube.
Ryerson & Son, Joseph T.

Explosives.
American Steel & Wire Co.

Fans, Exhaust & Ventilating.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Fasteners, Car Door.
Camel Sales Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Feed Water Heater Systems.
Bird-Archer Co., The.
Coffin, Jr., Co., The J. S.
Worthington Pump & Machinery Corp.

Fence Posts.
International Creosoting & Construction Co.

Fencing Wire — (See Wire Fence).

Fence Posts, Creosoted.
National Lumber & Creosoting Co.

Ferro Alloys.
Vanadium Corp. of America.

Ferro, Chromium.
Vanadium Corp. of America.

Ferro Molybdenum.
Electro Metallurgical Sales Corp.
Vanadium Corp. of America

Ferro Silicon.
Vanadium Corp. of America.

Ferro Tungsten.
Vanadium Corp. of America.

Ferro Vanadium.
Vanadium Corp. of America.

Filters, Air.
Westinghouse Air Brake Co.
Whiting Corporation.

Filters, Dust.
Whiting Corporation.

Filters, Water & Industrial.
Graver Tank & Mfg. Corp.

Filtration Plants, (Water).
Graver Tank & Mfg. Corp.

Fireboxes.
American Locomotive Co.
Baldwin Locomotive Works

Fire Fighting & Protection Equipment.
Johns-Manville Corp.

Fittings, Air Brakes.
Westinghouse Air Brake Co.

Fittings, Steam.
Vapor Car Heating Co., Inc.

Fixtures, Car Door.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Flangers, Snow.
Q & C Co., The.

Floodlights.
General Electric Supply Corp.
Graybar Electric Co.
Oxweld Railroad Service Co.
Pyle-National Co.
Symington Co., The.
Westinghouse Elec. & Mfg. Co.

Floodlights, Acetylene.
Oxweld Railroad Service Co., The.

Flooring.
Carey & Co., Philip, The.
Jennison-Wright Co.
Johns-Manville Corp.

Flooring, Car.
Tuco Products Corp.

Flooring, Coach.
Tuco Products Corp.

Flooring, Composition.
Johns-Manville Corp.
Tuco Products Corp.

Flooring, Creosoted.
Central Coal & Coke Co.

Flooring, Wood.
Central Coal & Coke Co.
Century Wood Preserving Co.

Floor Plates, Steel.
Carnegie Steel Co.
Illinois Steel Co.

Floor Slabs, Concrete.
American Cement Tile Mfg. Co.

Flue Cleaners—(See Cleaners, Flue).

Flue Cutters—(See Cutters, Flue).

Flues, Boiler — (See Tubes Boiler).

Flue Shop Equipment.
Ryerson & Son, Joseph T.

Forges, Rivet Heating.
Ryerson & Son, Joseph T.

Forging Hammers.
Industrial Brownhoist Corp.

Forgings.
American Bridge Co.
American Steel Foundries.
Bethlehem Steel Company.

Brill Co., The J. G.
Carnegie Steel Co.
Edgewater Steel Co.
General Railway Signal Co.
Gould Coupler Co., The
Illinois Steel Co.
Midvale Co., The.
Mt. Vernon Car Mfg. Co.
Neely Nut & Bolt Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Steel Car Forge Co.
Universal Draft Gear Attachment Co.

Forgings, Drop.
Brill Co., The J. G.
General Railway Signal Co.
Steel Car Forge Co.
Union Switch & Signal Co.

Forgings, Monel Metal.
International Nickel Co., The.

Foundry Equipment.
Whiting Corporation.

Foundry Supplies.
Bird-Archer Co., The

Frames, Cast Steel, Locomotive
General Steel Castings Corp.

Frames, Locomotive.
American Steel Foundries.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Mach. Co.
Ohio Steel Foundry Co., The.
Union Steel Casting Co.

Frames, Truck.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Buckeye Steel Castings Co.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Pyle-National Co.
Symington Co., The

Frames, Vanadium.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Mach. Co.
Union Steel Casting Co.

Frogs and Crossings.
Bethlehem Steel Company.
Continuous Rail Crossing Corp.
Ramapo Ajax Corp.

Fulcrums, Brake Beam.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
National Malleable & Steel Castings Co.

Furnaces, Electric.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Furnaces, Gasoline.
Railroad Supply Co.
Whiting Corporation.

Furnaces, Rivet Heating — (See Forges, Rivet Heating).

Furniture.
Aluminum Co. of America.

Gage Testers—(See Testers Gage).

Gages, Air.
Westinghouse Air Brake Co.

Gages, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Gages, Steam.
Ashton Valve Co.

Gages, Tire.
Schrader's Son, Inc., A.

Gages, Wheel Press Recording.
Ashton Valve Co.

Gaskets.
Westinghouse Air Brake Co.

Gasoline.
Ethyl Gasoline Corp.

Gear Blanks, Rolled Steel.
Edgewater Steel Co.
Standard Steel Works Co.

Gears and Pinions.
American Steel Foundries
Westinghouse Elec. & Mfg. Co.

Gears, Silent.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Gears, Valve — (See Valve Gears).

Generators, Acetylene.
Oxweld Railroad Service Co.

Generators, Car Lighting.
Safety Car Heating & Lighting Co.

Generators, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Goggles, Welding.
Oxweld Railroad Service Co., The.
Sunbeam Electric Mfg. Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Graphite Penetrating Oil.
Alemite Mfg. Corp.

Grapples, Wood.
Industrial Brownhoist Corp.

Grate Bars.
Q & C Co., The.

Grate Shakers, Automatic.
Franklin Railway Supply Co., Inc.

Grates.
Firebar Corp.

Greases.
Alemite Mfg. Corp.

Grease Forming Machines.
Franklin Railway Supply Co., Inc.

Grey Iron.
American Brake Shoe & Foundry Co.

Grinding Machines.
Sellers & Co., Inc., Wm.

Grinding Machines, Portable.
Ingersoll-Rand Co.

Guard Rails, Creosoted Wood
International Creosoting & Construction Co.

Guard Rails, Foot Guard.
Q & C Co., The.

Guard Rails (One Piece).
Bethlehem Steel Company.
Ramapo Ajax Corp.

Guard Switch Point.
Q & C Co., The.

Guards, Cattle.
American Bridge Co.

Guards, Dust.
Gould Coupler Co., The
Symington Co., The.

Hair Felt.
Johns-Manville Corp.

Hammers, Pneumatic.
Ingersoll-Rand Co.

Hammers, Riveting.
Ingersoll-Rand Co.

Hammers, Steam.
Industrial Brownhoist Corp.
Sellers & Co., Inc., Wm.

Hand Brakes—(See Brakes, Hand).

Hangers, Ball Bearing.
S. K. F. Industries, Inc.

Hand Rails & Fittings.
Aluminum Co. of America.

Hangers, Bottom Rod Safety.
Chicago Railway Equipment Co.

Hangers, Car Door — (See Fixtures, Car Door).

Headlight Repair Parts, Electric.
Electric Service Supplies Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Headlights, Electric.
General Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

Headlights, Reflectors & Cases.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Heaters, Electric.
Westinghouse Electric & Mfg. Co.

Heaters, Electric Rivet.
American Hoist & Derrick Co.

Heaters, Feedwater
Graver Tank & Mfg. Corp.

Heaters, Feedwater Locomotive.
Coffin Co., Jr., The J. S.
Superheater Company, The.
Worthington Pump & Machinery Corp.

Heaters, Feed Water, Stationary.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Heating & Ventilating Apparatus.
Vapor Car Heating Co., Inc.
Westinghouse, Electric & Mfg. Co.

Heating Equipment, Car.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Heating Systems, Car (Electric and Steam).
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

High Temperature Cements.
Carey & Co., Philip, The.

Highway Crossing Protection Devices.
American Bridge Co.
Franklin Railway Supply Co., Inc.
Railroad Supply Co.

Hoists, Air.
Whiting Corporation.

Hoists, Locomotive.
Whiting Corporation.

Hoists, Car, Coach.
Whiting Corporation.

Hoists, Chain.
Milwaukee Electric Crane & Hoist Corp.
Ryerson & Son, Jos. T.

Hoists, Electric.
American Hoist & Derrick Co.
Milwaukee Electric Crane & Hoist Corp.

Hoists, Pneumatic.
Ingersoll-Rand Co.

Hoists, Portable Car.
Whiting Corporation.

Hoists, Second-Hand.
Hyman-Michaels Co.

Hoisting Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.
Milwaukee Electric Crane & Hoist Corp.

Hooks, Wrecking.
National Malleable & Steel Castings Co.

Horns, Pneuphonic.
Westinghouse Air Brake Co.

Hose, Air, Steam, Etc.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Hose, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Hose, Tender.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Ice Cutters.
Jordan Co., O. F.

Incandescent Lamps.
General Electric Supply Corp.

Indicators, Speed & Cut-off.
Valve Pilot Co.

Ingots.
Birdsboro Steel Foundry & Mach. Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Interstate Iron & Steel Co.
McConway & Torley Co.
Standard Steel Works Co.

Injectors, Exhaust Steam.
Sellers & Co., Inc., Wm.
Superheater Co., The.

Inspection of Material and Equipment—(See Engineers, Inspection).

Insulated Wire.
General Cable Corp.
General Electric Supply Corp

Insulation, Car.
Carey Co., Philip, The.
Lehon Co., The.

Insulation, Car Bldg.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co

Insulation, Electrical.
General Cable Corp.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Insulation, Exhaust & Heater Pipe.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Heat.
Carey Co., Philip, The.
Miner, W. H.

Insulation Tape.
General Electric Supply Corp.

Insulators, Electrical, Porcelain.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Interlocking Plant Equipment.
General Railway Signal Co.
Union Switch & Signal Co.

Iron Chain.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.

Iron, Charcoal.
Bethlehem Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.

Iron, Engine Bolt.
Lockhart Iron & Steel Co.

Iron, Forging Billets.
Lockhart Iron & Steel Co.

Iron, Hollow Staybolt.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Hollow Staybolt Bars.
Bethlehem Steel Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Pig.
Bethlehem Steel Co.

Iron, Refined.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Iron, Staybolt — (See also Staybolts).
Ewald Iron Co.
Falls Hollow Staybolt Co.
Interstate Iron & Steel Co.
Lockhart Iron & Steel Co
Reading Iron Co.
Ryerson & Son, Jos. T.

Jacking, Locomotive
Carey Co., Philip, The.

Jacks, Smoke.
Carey Co., Philip, The.
Johns-Manville Corp.

Jacks, Screw Electric—Locomotive & Car Lighting.
Whiting Corporation.

Joints, Air Reservoir.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Blow Off Line (Roundhouse).
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Coach and Coach Yard.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Flexible.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Flexible Ball.
Barco Mfg. Co.

Joints, Rail.
American Steel Foundries.
Carnegie Steel Co.
Illinois Steel Co.
Q & C Co., The.
Rail Joint Co.
Union Switch & Signal Co.

Joints, Steam, Air & Liquid.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Swing.
Barco Mfg. Co.
Vapor Car Heating Co., Inc.

Journal Boxes and Lids.
Allegheny Steel Co.
American Steel Foundries.
Brill Co., The J. G.
Gould Coupler Co., The.
Hunt-Spiller Mfg. Corp.
National Malleable & Steel Castings Co.
Pullman Car & Mfg. Corp.
Railway Steel Spring Co.
Symington Co., The.
Union Spring & Mfg. Co.

Journal Oilers, Car & Locomotive.
Ardco Mfg. Co.

Keys, Brake Shoe.
Bradford Corporation.
Mt. Vernon Car Mfg. Co.
Steel Car Forge Co.
Union Spring & Mfg. Co.

Knuckles Emergency.
Q & C Co., The.

Laboratories, Testing.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Lacquers.
General Electric Supply Corp.
Sherwin-Williams Co.

Ladders, Steel Car.
Wine Railway Appliance Co.

Lagging, Locomotive.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lamps, Incandescent.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lamps, Inspector's.
Oxweld Railroad Service Co., The.

Lath, Metal.
American Rolling Mill Co., The.
Truscon Steel Co.

Lathes, Axle.
Sellers & Co., Inc., Wm.

Lathes, Engine.
Ryerson & Son, Joseph T.

Lathes, Wheel.
Sellers & Co., Inc., Wm.

Lead, White.
National Lead Co.

Lighting Equipment, Car.
Electric Storage Battery Co.
Safety Car Htg. & Ltg. Co.

Lighting Fixtures and Systems.
General Electric Supply Corp.
Graybar Electric Co.
Pyle-National Co.
Safety Car Htg. & Ltg. Co.

Lighting Plants, Gas, Electric
Sunbeam Electric Mfg. Co.

Lightning Arresters.
General Electric Supply Corp.

Line Material.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lock Nuts—(See Nut Locks).

Locomotive Water Conditioners.
Bird-Archer Co., The.

Locomotives, Contractors.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Electric.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Locomotives, Gasoline.
Baldwin Locomotive Works.

Locomotives, Gas-Electric.
Electro Motive Co.

Locomotives, Geared.
Lima Locomotive Works.

Locomotives, Industrial.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Mine.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Oil Engine, Electric Driven.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb & Co., Geo. D.

Locomotives, Rebuilt.
American Locomotive Co.

Locomotives, Repair Parts.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Second-Hand.
Hyman-Michaels Co.

Locomotives, Steam.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotive Stokers.
Standard Stoker Co.

Locomotive Valve Pilot.
Valve Pilot Co.

Lubricants.
Alemite Mfg. Corp.

Lubrication Equipment.
Alemite Mfg. Corp.

Lubrication Systems.
Alemite Mfg. Corp.

Lubricators, Driving Box.
Franklin Railway Supply Co., Inc.

Lubricators, Piston Rod.
Q & C Co., The.

Lumber.
Central Coal & Coke Co.
Curtin-Howe Corp.
West Coast Lumber Trade Extension Bureau.

Lumber, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lumber, Creosote Treated.
International Creosoting & Construction Co.

Lumber, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Industrial Lumber & Creosoting Co.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Machinery, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Machine Screws, Monel Metal
International Nickel Co., The.

Magnets, Lifting.
Industrial Brownhoist Corp.
Electro Metallurgical Sales Corp.

Mechanical Draft Apparatus—(See Heating and Vent. App.)

Mechanical Stokers.
Standard Stoker Co.

Melters, Snow, Electric.
Q & C Co., The.

Metallic Flexible Conduit.
General Electric Supply Corp.

Meters, Water & Oil.
Worthington Pump & Machinery Corp.

Milling Machines, Planer Type.
Sellers & Co., Inc., Wm.

Milling Machines, Plain and Universal.
Ryerson & Son, Joseph T.

Mohair Upholstery Velvets.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Molybdenum Metal.
Vanadium Corp. of America.

Monel Metal, Rods, Sheets, Tubes, Wire, etc.
International Nickel Co., The.

Motors, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Motors & Generators.
Fairbanks-Morse & Co.

Moulding.
Aluminum Co. of America.

Movers, Locomotive.
Whiting Corporation.

Multiple V Belt Drives
Worthington Pump and chinery Corp.

Nails.
American Steel & Wire Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Nipples, Air Hose.
Prime Manufacturing Co.

Nozzles, Exhaust.
Franklin Railway Supply Co., Inc.

Nozzles, Oxy-Acetylene Cutting.
Oxweld Railroad Service Co., The.

Nuts—(See Bolts and Nuts).

Nut Locks.
Dardelet Threadlock Corp.
Grip Nut Co.
Reliance Mfg. Co.

Nuts, Tank Hose.
Prime Manufacturing Co., The.

Office Appliances.
Remington-Rand Business Service

Oil-Electric Locomotives.
American Locomotive Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.

Oil Filtering & Storage Systems.
Graver Tank & Mfg. Corp.

Oil, Linseed.
National Lead Co.

Oil Plugs, Steam Chest.
Franklin Railway Supply Co., Inc.

Oxy-Acetylene Apparatus.
Oxweld Railroad Service Co., The.

Oxygen.
Oxweld Railroad Service Co., The.

Packing, Air Pump.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.

Packing, Cylinder and Valve Ring.
Hunt-Spiller Mfg. Corp.
Westinghouse Air Brake Co.

Jacking, Locomotive.
Johns-Manville Corp.

Packing, Locomotive Cab Cock.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Ring Boiler.
Union Asbestos & Rubber Co.

Packing, Semi-Metallic.
Pilot Packing Co.
Central Alloy Steel Corp.

Packing, Sheet.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Soft.
Carey & Co., Philip, The.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.

Packing, Throttle.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing.
Westinghouse Air Brake Co.

Paint Burners, Acetylene.
Oxweld Railroad Service Co., The.

Paint, Metal Protective.
National Lead Co.
Sherwin-Williams Co

Paint, Powder.
Aluminum Co. of America.

Paints.
Lehon Co., The.
National Lead Co.
Sherwin-Williams Co.

Paper, Carbon.
Remington-Rand Business Service

Paper, Sheathing.
Carey & Co., Philip, The.
Lehon Co., The.

Pavement Breakers.
Ingersoll-Rand Co.

Pickling Equipment, Monel Metal.
International Nickel Co., The.

Pile Drivers.
American Hoist & Derrick Co.
Industrial Brownhoist Co.

Piling, Creosoted.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Piling, Sheet Steel.
American Bridge Co.
Carnegie Steel Co.

Pilot Beams, Cast Steel.
General Steel Castings Corp.
Gould Coupler Co., The

Pilots, Cast Steel.
General Steel Castings Corp.
Locomotive Finished Material Co.

Pins, Airbrake.
Steel Car Forge Company.

Pins, Center.
Miner, W. H.

Pins, Coupler Knuckle.
McConway & Torley Co.
National Malleable & Steel Castings Co.

Pins, Crank.
American Locomotive Co.
Baldwin Locomotive Works
Miner, Inc., W. H.
Standard Steel Works Co.
Union Asbestos & Rubber Corp.

Pipe Coverings.
Carey & Co., Philip, The.
Johns-Manville Corp.

Pipe Fittings—(See Fittings, Pipe).

Pipe, Metal Culvert.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Republic Steel Corp.

Pipe, Steel Signal.
National Tube Co.

Pipe, Wrought Iron.
Byers Co., A. M.
Reading Iron Co.

Pits, Drop Pit Tables.
Whiting Corporation.

Planers, Plate.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Plates.
Steel Car Forge Co.

Plates, Follower.
Steel Car Forge Co.

Plates, Boiler, Firebox—(See Steel Firebox).

Plates, Center—(See Bearings, Center).

Plates, Iron & Steel.
American Rolling Mill Co., The.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Interstate Iron & Steel Co.
Ryerson & Son, Joseph T.

Plates, Tie.
Illinois Steel Co.
Inland Steel Company.
Interstate Iron & Steel Co.
Railroad Supply Co.
Tennessee Coal, Iron & Railroad Co.

Plates, Tin and Terne.
American Sheet & Tin Plate Co.

Platforms, Car.
Gould Coupler Co., The.
Standard Coupler Co.

Platforms, Cast Steel, Passenger Car
General Steel Castings Corp.

Plows, Railroad and Grading.
Western Wheeled Scraper Co.

Plows, Snow.
American Locomotive Co.
Brill Co., The J. G.
Clark Tructractor Co.
Jordan Co., O. F.
Q & C Co., The.

Plugs, Arch Tube.
Prime Mfg. Co., The.

Plugs, Oil & Grease Cup.
Prime Mfg. Co., The.

Plugs, Washout.
Prime Mfg. Co., The.

Plush, Mohair.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Pneumatic Tools.
Ingersoll-Rand Co.

Poles.
Central Coal & Coke Co.
General Electric Supply Corp.
Graybar Electric Co.

Poles, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Poles, Signal.
General Railway Signal Co.
International Creosoting & Construction Co.
Union Switch & Signal Co.
Whiting Corporation.

Poles, Steel Tubular.
Graybar Electric Co.
National Tube Co.

Poles, Zinc Metal Arsenite Treatment.
Curtin-Howe Corp.

Posts, Fence.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Posts, Fence, Creosoted.
Inland Steel Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Posts, Steel Fence.
American Steel & Wire Co.
Q & C Co., The.

Powder, Blasting—(See Explosives).

Powdered Coal Equipment.
Muhlfeld, John E.

ower Transmission Supplies.
Sellers & Co., Inc., Wm.

Power Plants.
General Electric Co.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Power Shovels.
American Hoist & Derrick Co.
Northwest Engineering Co.

Power Transmission Supplies.
Sellers & Co., Inc., Wm.
Wrought Iron Co. of America.

Preservatives, Wood.
Century Wood Preserving Co.
Jennison-Wright Co.

Presses, Flanging Hydraulic
Birdsboro Steel Foundry & Mach. Co.

Presses, Hydraulic.
Birdsboro Steel Foundry & Mach Co.

Presses, Wheel.
Birdsboro Steel Foundry & Mach Co.
Sellers & Co., Inc., Wm.

Pulverizers, Coal — (See Crushers, Coal).

Pullers, Car Electric.
Whiting Corporation.

Pullshovels.
American Hoist & Derrick Co.
Whiting Corporation.

Pulverized Coal Burning Systems.
Whiting Corporation.

Pumping Stations.
Fairbanks-Morse & Co.

Pump Liners, Monel Metal.
International Nickel Co., The.

Pump Rods, Monel Metal.
International Nickel Co., The.

Pump Shafts, Monel Metal.
International Nickel Co., The.

Pumps, Hydraulic.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pumps & Pumping Machinery.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Pumps, Vacuum.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Punching and Shearing Machines.
Ryerson & Son, Joseph T.

Pushers, Coal.
Standard Stoker Co.

Pyrometers, Superheated Steam.
Superheater Co., The.

Rail Anchors.
Bethlehem Steel Co.
P. & M. Co., The.

Rail-Bonds.
American Steel & Wire Co.
General Cable Corp.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Rail Braces — (See Braces, Rail).

Rail Cranes.
American Hoist & Derrick Co.

Rail Reclamation Equipment.
Ryerson & Son, Joseph T.

Railroad Shops.
United Engineers & Constructors, Inc.

Rail Splice Plates — (See Joints, Rail).

Railroad Structures — (See Engineers and Contractors; also Building).

Rails.
Bethlehem Steel Co.
Carnegie Steel Co.
Hyman-Michaels Co.
Illinois Steel Co.
Inland Steel Co.
Tennessee Coal, Iron & Railroad Co.
Thomson Rail Corp.

Rails, Relaying.
Hyman-Michaels Co.

Railway Signals.
General Electric Supply Corp.

Rattan.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Receivers, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.

Recorders, Speed & Cut-off.
Valve Pilot Co.

Rectifiers for Signal Work.
General Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.

Reducing Valves.
Vapor Car Heating Co., Inc.

Reflectors, Headlight.
Sunbeam Electric Mfg. Co.

Refrigerators.
American Radiator Co.
Wine Railway Appliance Co.

Regulators, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Relays.
General Railway Signal Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Removers, Paint & Varnish.
Oakite Products, Inc.

Repair Parts, Stoker.
Standard Stoker Co.
Q & C Company, The.

Retorts Creosoting.
Graver Tank & Mfg. Corp.

Reverse Gear, Power.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Rivet Cutters.
Ingersoll-Rand Co.
Interstate Iron & Steel Co.

Riveters, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Riveting Machines.
Ingersoll-Rand Co.

Rivets.
Inland Steel Co.
Neely Nut & Bolt Co.
Ryerson & Son, Joseph T.
Pressed Steel Car Co.
Russell, Burdsall & Ward Bolt and Nut Co.

Rods.
Neely Nut & Bolt Co.

Rolled Steel.
Carnegie Steel Co.

Roller Bearings (See Bearings, Roller).

Rolls, Bending & Straightening.
Birdsboro Steel Foundry & Mach. Co.

Roof Decks, Steel.
Mahon Co., R. C.

Roof Slabs, Concrete.
Federal American Cement Tile Co.

Roofing, Asbestos.
Carey & Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.

Roofing, Buildings.
American Rolling Mill Co.
Carey Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.

Roofing, Car.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Carey & Co., Philip, The.
Lehon Co., The.
Hutchins Car Rfg. Co.
Johns-Manville Corp.
Tuco Products Corp.
Union Metal Products Co.

Roofing, Corrugated.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Carey Co., Philip, The.
Johns-Manville Corp.

Roofing, Tile.
Federal American Cement Tile Co.

Roofing, Tile, Cement.
Federal American Cement Tile Co.

Roofing, Tin.
American Sheet & Tin Plate Co.

Rope, Wire — (See Wire Rope).

Rust Preventatives.
Dearborn Chemical Co.
Oakite Products, Inc.

Safe Ends.
National Tube Co.

Sand Drying Plants.
Roberts & Schaefer Co.

Sand Plants.
Railway Engineering Equipment Co.

Sanitary Products.
West Disinfecting Co.

Sash Balances.
Tuco Products Co.

Saws, Circular Metal.
Ryerson & Son, Joseph T.

Saws, High Speed, Friction.
Ryerson & Son, Joseph T.

Saws, Portable Rail.
Industrial Brownhoist Corp
Q & C Co., The.

Scales.
Fairbanks-Morse & Co.

Scrapers, Wheeled and Drag.
Western Wheeled Scraper Co.

Screens, Passenger Car.
Tuco Products Corp.

Seats, Car.
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Coach.
Brill Co., The J. G.

Shafting.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.
Standard Steel Works Co.

Shapers.
Ryerson & Son, Joseph T.

Shapes, Pressed Steel.
Pressed Steel Car Co.
Sellers & Co., Inc., Wm.

Shapes, Structural.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheds, Train.
American Bridge Co.
Inland Steel Co.

Sheets, Black and Galvanized.
Allegheny Steel Co.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Inland Steel Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Blue Annealed.
Allegheny Steel Co.

Sheets, Car & Building.
American Rolling Mill Co.

Sheets, Corrugated.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Carey Co., Philip, The.
Carnegie Steel Co.
Johns-Manville Corp.
Ryerson & Son, Joseph T.

Sheets, Corrugated and Plain.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheets, Electrical.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Iron & Steel.
American Rolling Mill Co.
Bethlehem Steel Co.

Sheets, Locomotive Jacket.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Inland Steel Co.

Sheets, Polished or Planished. Iron.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.

Sheets, Steel.
American Rolling Mill Co., The.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sherardising Plants.
General Electric Co.

Shop Calling Systems—(See Systems, Communication)

Shops, Railroad—(See Buildings, Iron, Steel and Steel Concrete).

Shovels & Draglines.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Shovels, Gasoline & Electric.
American Hoist & Derrick Co.

Shovels, Steam, Gasoline & Electric.
American Hoist & Derrick Co.
Clark Tructractor Co.
Orton Crane & Shovel Co.

Siding, Bldg., Car, Corrugated & Plain.
Kinnear Mfg. Co.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Inland Steel Co.

Siding, Corrugated & Plain.
Carey & Co., Philip, The.
Johns-Manville Corp.

Siding, Iron & Steel.
American Rolling Mill Co.

Signal Accessories.
Electric Storage Battery Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Signals, Automatic Cab.
General Railway Signal Co.
Union Switch & Signal Co.

Signal Blades.
General Railway Signal Co.
Union Switch & Signal Co.

Signals, Crossing.
Union Switch & Signal Co.

Signals, Crossing Protection.
General Railway Signal Co.
Railroad Supply Co.

Signals, Railway.
General Electric Co.
Union Switch & Signal Co.

Signs, Highway Crossing.
Railroad Supply Co.

Silico Manganese.
Vanadium Corp. of America

Silicon.
Electro Metallurgical Sales Corp.

Slabs, Concrete Floor.
American Cement Tile Mfg. Co.
Federal Cement Tile Co.

Slag, Blast Furnace.
Carnegie Steel Co.

Slotting Machines.
Sellers & Co., Inc., Wm

Slotting Machines, Locomotive Cylinder.
American Steel & Wire Co.

Sludge Removers.
Bird-Archer Co., The.

Soap, Liquid.
West Disinfecting Co.

Snow Plows.
Jordan Co., O. F.

Solder.
National Bearing Metals Corp.
Westinghouse Elec. & Mfg. Co.

Special Machinery.
Whiting Corporation.

Speed Indicators & Recorders.
Valve Pilot Corp.

Spelter—(See Zinc).

Spikes.
American Steel & Wire Co.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Splice Bars, Angle.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.

Spreaders, Ballast.
Jordan Co., O. F.

Spring, Plates or Seats.
Allegheny Steel Co.
National Malleable & Steel Castings Co.
Union Spring & Mfg. Co.

Springs.
American Steel Foundries Co.
American Steel & Wire Co.
Railway Steel Spring Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Switch & Signal Co.

Springs, Shop Equipment.
Ryerson & Son, Joseph T.

Springs, Vanadium Steel.
Union Spring & Mfg. Co.

Stacks, Steel.
American Bridge Co.
Graver Tank & Mfg. Corp.

Stands, Switch & Target.
Q & C Co., The.

Staybolts.
American Locomotive Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Flannery Bolt Co.
Ryerson & Son, Joseph T.

Staybolts, Hollow.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Steam Chests.
Franklin Railway Supply Co., Inc.

Steam Enclosures, Corrugated Iron.
Republic Steel Corp.

Steam Shovels.
American Hoist & Derrick Co.
Orton Crane & Shovel Co.

Steel Alloy.
Illinois Steel Co.
Ryerson & Son, Joseph T.
Republic Steel Corp.
Standard Steel Works Co.

Steel, Firebox.
Carnegie Steel Co.
Illinois Steel Co.

Steel, Heat Treated.
Interstate Iron & Steel Co.

Steel & Iron, Stainless.
Allegheny Steel Co.

Steel, Open Hearth.
Carnegie Steel Co.
Illinois Steel Co.

Steel Plate Construction.
Graver Tank & Mfg. Corp.

Steel, Pressed Specialties.
Hale-Kilburn Co.

Steel, Structural.
American Bridge Co.
Carnegie Steel Co.
Graver Tank & Mfg. Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Steel, Tool.
Illinois Steel Co.
Midvale Co., The.
Q & C Co., The.
Ryerson & Son, Joseph T.

Step Joints.
Q & C Co., The
Rail Joint Co.

Steps, Car—(See Car Steps, Safety).

Stokers, Industrial.
Whiting Corporation.

Stokers, Locomotive.
Standard Stoker Co.

Stokers, Mechanical.
Westinghouse Elec. & Mfg. Co.

Stoker Repair Parts.
Standard Stoker Co.

Storm Sewers, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Strainer, Air.
Westinghouse Air Brake Co.

Strainers, Tank Hose.
Prime Mfg. Co., The.

Stream Enclosures, Corrugated Iron.
Armco Culvert Mfrs. Assoc.

Stringers, Bridge.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.

Stringers, Bridge, Creosoted.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Structural Shapes, Rolled Shapes.
Carnegie Steel Co.

Superheaters.
Superheater Co., The.

Supports, Bottom Rod Safety.
Chicago Railway Equipment Co.

Switch Boards.
Graybar Electric Co.
Johns-Manville Corp.
Westinghouse Elec. & Mfg. Co.

Switch Machines.
General Railway Signal Co.

Switch Movements.
Union Switch & Signal Co.

Switch Ties.
International Creosoting & Construction Co.

Switch Ties, Creosoted.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Switches, Electric.
Electric Service Supplies Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Switches & Switch Stands.
Ramapo Ajax Corp.

Syphons, Corrugated Iron.
Armco Culvert Mfrs. Association.
Republic Steel Corp.

Syphons, Locomotive.
Locomotive Firebox Co.

Syphons, Locomotive, Boilers
Locomotive Firebox Co.

Tables, Drop Pit Electric.
Whiting Corporation.

Tables, Transfer.
Whiting Corporation.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tamping Machines, Tie.
Ingersoll-Rand Co.

Tamping Outfits, Tie.
Ingersoll-Rand Co.

Tanks, Acetylene, Gas.
Oxweld Railroad Service Co., The.

Tanks, Air, Gas, Oil and Water.
Graver Tank & Mfg. Corp.

Tanks, Water.
American Bridge Co.
American Locomotive Co.
National Tube Co.
Pressed Steel Car Co.
Westinghouse Air Brake Co.

Tape, Insulation.
Johns-Manville Corp.
Okonite Co., The.
Westinghouse Elec. & Mfg. Co.

Taps, Staybolt.
Ryerson & Son, Joseph T.

Tele. & Tele. Wire.
General Cable Corp.
General Electric Supply Corp.

Terminals, Railroad.
United Engineers & Constructors, Inc.

Testers, Boiler.
Sellers & Co., Inc., Wm.

Testers, Gage.
Ashton Valve Co.

Testers, Rail.
Sperry Products, Inc.

Testers, Staybolt.
Flannery Bolt Co.

Testing Machines, Drop.
Whiting Corporation.

Thermostats.
Vapor Car Heating Co., Inc.

Throttles.
American Throttle Co.

Tie Plates.
Bethlehem Steel Co.
Illinois Steel Co.
Railroad Supply Co.

Ties, Creosoted.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Ties, Steel.
American Bridge Co.
Bethlehem Steel Co.
Carnegie Steel Co.

Ties, Wood.
Curtin-Howe Corp.
International Creosoting & Construction Co.

Tile, Cement, Concrete.
Federal American Cement Tile Co.

Timber.
Central Coal & Coke Co.
Curtin-Howe Corp.

Tires.
Firestone Tire & Rubber Co.
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.
Goodrich Rubber Co., B. F.

Timber, Creosoted.
Century Wood Preserving Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Tires, Steel.
Edgewater Steel Co.
Midvale Co., The.
Railway Steel Spring Co.
Standard Steel Works Co.

Toilet Papers.
U. S. Envelope Co.

Tools, High Speed Steel.
Bethlehem Steel Co.
Bird-Archer Co., The.

Towers, Floodlight.
Pyle-National Co.

Track, Overhead.
Whiting Corporation.

Track Skates.
Q & C Co., The.

Tractors.
Caterpillar Tractor Co.
Elwell-Parker Electric Co.
Industrial Lumber Co.
International Creosoting & Construction Co.
West Coast Lumber Trade Extension Bureau.

Tractors, Industrial.
Clark Tructractor Co.
Elwell-Parker Electric Co.
International Harvester Co.

Tractors, Turntable.
Nichols & Bros., Geo. P.
Whiting Corporation.

Trailers.
Clark Tructractor Co.

Train Control Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Tramrail System, Overhead.
Whiting Corporation.

Tramways, Wire Rope.
American Steel & Wire Co.

Transfer Tables.
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bros., Geo. P.
Whiting Corporation.

Transformers.
General Electric Supply Corp.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Trap Doors.
Edwards Co., O. M.

Trap Doors & Fixtures.
Tuco Products Corp.

Traps, Steam.
Johns-Manville Corp.

Treads, Bridge Floor.
Carnegie Steel Co.

Treads, Safety.
Ryerson & Son, Joseph T.

Treatment, Water—(See Water Softening and Purifying).

Trolleys, Monorail.
Whiting Corporation.

Truck Frames—(See Frames, Truck).

Trucks, Oxy-Acetylene Supply.
Oxweld Railroad Service Co., The.

Trucks, Car.
St. Louis Car Co.

Trucks, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bettendorf Company, The.
Birdsboro Steel Foundry & Mach. Co.
Brill Co., The J. G.
Flexible Truck Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co.
Mt. Vernon Car Mfg. Co
Pressed Steel Car Co.
St. Louis Car Co.
Standard Car Truck Co.
Symington Co., The.

Trucks, Cast Steel Tender
General Steel Castings Corp.

Trucks, Cast Steel, Electric Car
General Steel Castings Corp.

Trucks, Cast Steel, Car & Locomotive
General Steel Castings Corp.

Trucks, Dump.
Clark Tructractor Co.

Trucks, Electric Storage Battery.
Elwell-Parker Electric Co.
Whiting Corporation.

Trucks, Industrial.
Elwell-Parker Electric Co.

Trucks, Motor.
Dodge Motor Truck Corp.
General Motors Truck Co.
International Harvester Co.
White Co., The.

Trucks, Shop.
Clark Tructractor Co.
Whiting Corporation.

Trucks, Tender.
Flexible Truck Co.

Trucks, Trailer.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.

Tubes, Arch.
National Tube Co.

Tubes, Boiler.
Allegheny Steel Co.
Bethlehem Steel Co.
National Tube Co.
Ryerson & Son, Joseph T.

Tubes, Boiler, Charcoal Iron.
Bethlehem Steel Co.
Reading Iron Co.

Tubes, Staybolt.
Falls Hollow Staybolt Co.

Tubes, Tire.
Firestone Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Tubing.
Aluminum Co. of America.

Tubing, Seamless Steel.
National Tube Co.

Tungsten Metal.
Vanadium Corp. of America.

Turbo Generators.
Electric Service Supplies Co.
General Electric Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Turnbuckles.
American Bridge Co.
American Steel & Wire Co.
Ryerson & Son, Joseph T.

Turntable Tractors.
Nichols & Bros., Geo. P.
Whiting Corporation.

Turntables.
American Bridge Co.
Industrial Brownhoist Corp.

Turntables, Overhead Track.
Whiting Corporation.

Turntables, Industrial.
Whiting Corporation.

Turntables, Motor Bus.
Whiting Corporation.

Typewriter Ribbons.
Remington-Rand Business Service.

Typewriters.
Remington-Rand Business Service.

Uncoupling Device.
Hutchins Car Rfg. Co.

Undercrossings, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Underfloor Duct.
General Electric Supply Corp.

Underfloor Duct, Fibre and Metal.
Johns-Manville Corp.

Underframes, Cast Steel. Tender
General Steel Castings Corp.

Underframes, Cast Steel, Freight Car.
General Steel Castings Corp.

Underframes, Steel.
Bettendorf Co., The.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Underground Conduit.
General Electric Supply Corp.

Upholstery, Car.
Brill Co., The J. G.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Valve Caps.
Schrader's Son, Inc., A.

Valve Gears, Locomotive.
Pyle-National Co.

Valves, Air Brake.
Westinghouse Air Brake Co.

Valves, Back Pressure Acetylene.
Oxweld Railroad Service Co., The.

Valves, Blow-Off.
Bird-Archer Co., The.

Valves, Check & Angle Steam
Sellers & Co., Inc., Wm.

Valves, Drifting.
Ardco Mfg. Co.
Sellers & Co., Inc., Wm.

Valves, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Valves, Piston.
Franklin Railway Supply Co., Inc.

Valves, Pop, Safety & Relief.
Ashton Valve Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Valves, Pressure Regulating.
Gold Car Heating & Lighting Co.

Valves, Tire.
Schrader's Son, Inc., A.

Valves, Throttle.
Bradford Corporation.

Vanadium.
Electro Metallurgical Sales Corp.

Varnish Powder.
Aluminum Co. of America.

Varnishes.
General Electric Supply Corp.
Sherwin-Williams Co.

Ventilators, Car.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Ventilators, Shop & Roundhouse.
Carey Co., Philip, The.
Johns-Manville Corp.

Wardrobes, Rolling and Disappearing Front — (See Lockers).

Washers.
National Malleable & Steel Castings Co.
Reliance Mfg. Co.
Ryerson & Son, Joseph T.
Wine Railway Appliance Co.

Washers, Boiler.
Sellers & Co., Inc., Wm.

Washers, Lock.
Reliance Manufacturing Co., The.

Washers, Railway Car.
Whiting Corporation.

Water Alarms — (See Low Water Alarms).

Waterproofing Materials and Compounds.
Carey Co., Phillip, The.
Lehon Co., The.
Johns-Manville Corp.

Water Purifying Materials & Compounds.
Bird-Archer Co., The.
Dearborn Chemical Co.

Water Softening & Purifying.
Bird-Archer Co., The.
Dearborn Chemical Co.
Graver Tank & Mfg. Corp.

Weather Stripping.
Tuco Products Corp.

Wedges, Automatic.
Franklin Railway Supply Co., Inc.

Wedges, Journal Box.
American Steel Foundries.
Gould Coupler Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Company.
Symington Co., The.

Weed Killer.
Q & C Co., The.

Welding Equipment.
Clark Tructractor Co.

Welding Machines, Acetylene.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Welding Machines, Electric.
General Electric Co.
Ryerson & Son, Joseph T.

Welding Machines, Flue.
Ryerson & Son, Joseph T.

Welding Materials.
Oxweld Railroad Service Co.
Franklin Railway Supply Co., Inc.

Welding Process.
Oxweld Railroad Service Co.

Welding Rods.
American Steel & Wire Co.
General Electric Supply Corp.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.

Welding Supplies.
General Electric Co.
Oxweld Railroad Service Co., The.

Welding and Cutting Apparatus—(See Cutting and Welding Apparatus).

Well Casings, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Wheel Centers, Driving.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Birdsboro Steel Foundry & Mach. Co.
Edgewater Steel Co.
Hunt-Spiller Mfg. Corp.
Standard Steel Works Co.
Union Steel Casting Co.

Wheels, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Cast Iron, Chilled Tread.
Assn. of Mfrs. of Chilled Car Wheels.
Graybar Electric Co.
Griffin Wheel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Wheels, Mine Car.
Carnegie Steel Co.
Edgewater Steel Co.
Mt. Vernon Car Mfg. Co.
Standard Steel Works Co.

Wheels, Passenger Car.
Carnegie Steel Co.
Illinois Steel Co.
Edgewater Steel Co.
Pullman Car & Mfg. Corp.
Standard Steel Works Co.

Wheels, Steel and Steel Tired
American Locomotive Co.
American Steel Foundries.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Wrought Steel.
American Rolling Mill Co.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Standard Steel Works Co.

Whistles.
Ashton Valve Co.

Whistles, Locomotive.
General Electric Co.
Westinghouse Air Brake Co.

Window Fixtures.
Edwards Co., O. M.
Tuco Products Corp.

Windows, Locomotive Cab, Clear Vision.
Prime Manufacturing Co.

Windshield Wings, Loco.
Prime Mfg. Co., The.

Wire.
American Steel & Wire Co.
General Cable Corp.
Kerite Insulated Wire & Cable Co.
Okonite Co., The

Wire, Fence.
American Steel & Wire Co.

Wire, Insulated.
American Steel & Wire Co.
General Cable Corp.
General Electric Co.
Graybar Electric Co.
Kerite Insulated Wire & Cable Co.
Okonite Co., The.

Wire, Rail Bond.
American Steel & Wire Co.
General Cable Corp.
Graybar Electric Co.

Wire Rope Clips.
American Hoist & Derrick Co.

Wire Rope.
American Steel & Wire Co.

Wire, Telephone & Telegraph.
American Steel & Wire Co.
General Cable Corp.
Graybar Electric Co.

Wire, Welding.
Oxweld Railroad Service Co., The.

Wiring Appliances.
Pyle-National Co.

Wood, Creosoted.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Wood Preservative — (See Preservative, Wood).

Wrecking Cranes — (See Cranes, Wrecking).

Zirconium.
Electro Metallurgical Sales Corp.

Index To Advertisers

A

Allegheny Steel Co. 41
American Arch Co., Inc., The 29
American Brake Shoe & Foundry Co. 41
American Locomotive Co. . 30
Ashton Valve Co. 40

B

Baldwin Locomotive Works, The 4
Battey & Kipp, Inc. 42
Bendix-Westinghouse Automotive Air Brake Co. .. 12
Bettendorf Company, The . 20
Birdsboro Steel Foundry & Machine Co. 24
Bixby, Inc., R. W. 42
Buffalo Brake Beam Co. .. 41
Buyers' Index 43, 44, 45, 46, 47, 48, 49

C

Camel Co. 39
Carnegie Steel Co. 32
Century Wood Preserving Co. 40
Classified Advertisements .. 42
Curtin-Howe Corporation .. 8

D

Dodge Truck Corp. 15

E

Ethyl Gasoline Corp. 17

F

Falls Hollow Staybolt Co. . 41
Firebar Corporation 34
Firestone Tire & Rubber Co. 14
Franklin Railway Supply Co., Inc. 28

G

General Electric Co. 19
General Railway Signal Co. 6, 7
Get Together Department .. 42
Grip Nut Company 52
Gulick-Henderson Company 42

H

Harbison-Walker Refractories Co. 29
Hunt Co., Robert W. 42
Hunt-Spiller Mfg. Corp. ... 35
Hutchins Car Roofing Co. . 26
Hyman-Michaels Co. 42

I

Illinois Steel Co. 31
International Creosoting & Construction Co. 2
International Harvester Co. 13

J

Jennison-Wright Co., The 41
Jordan Co., O. F. 40

K

Kerite Insulated Wire & Cable Co., The 39

L

Lima Locomotive Works, Inc. 27

M

Magnus Co. 38
Michigan Wood Preserving Co. 40
Miner, Inc., W. H. 3
Mt. Vernon Car Mfg. Co. 40
Muhlfeld, John E. 42

N

National Lead Co. 10
New England Wood Preserving Co. 40
Nichols & Bros., Geo. P., The 41

O

Oakite Products, Inc. 38
Ohio Locomotive Crane Co., The 40
Ohio Wood Preserving Co. 40
Okonite-Callender Cable Co., Inc., The 38
Okonite Co., The 38

P

P. & M. Co., The 40
Pilot Packing Co., Inc. 41
Pittsburgh Testing Laboratory 42
Professional Directory 42

R

Railroad Supply Co. 40
Railway Educational Bureau, The 42
Ramapo Ajax Corp. 41
Reliance Manufacturing Co., The 51
Republic Steel Corp. 33
Ryerson & Son, Inc., Jos. T. 41

S

Safety Car Heating & Lighting Co., The 39
Simmons-Boardman Publishing Co. 16
S. K. F. Industries, Inc. .. 25
Standard Car Truck Co. .. 39
Standard Steel Works Co. 21
Steel Car Forge Co. 41
Stucki Co., A. 41
Superheater Co., The 37

T

Timken-Detroit Axle Co., The 18
Timken Roller Bearing Co., The 23
Tuco Products Corp. 41

U

Union Asbestos & Rubber Co. 41
Union Metal Products Co. . 22
Union Spring & Mfg. Co. .. 40
Union Steel Casting Co. .. 41

V

Vapor Car Heating Co. .. 39

W

West Disinfecting Co. 38
Western Wheeled Scraper Co. 41
Westinghouse Air Brake Co. 36
Westinghouse Elec. & Mfg. Co. 11
Whitcomb Co., Geo. D. .. 9
Wine Railway Appliance Co., The 1

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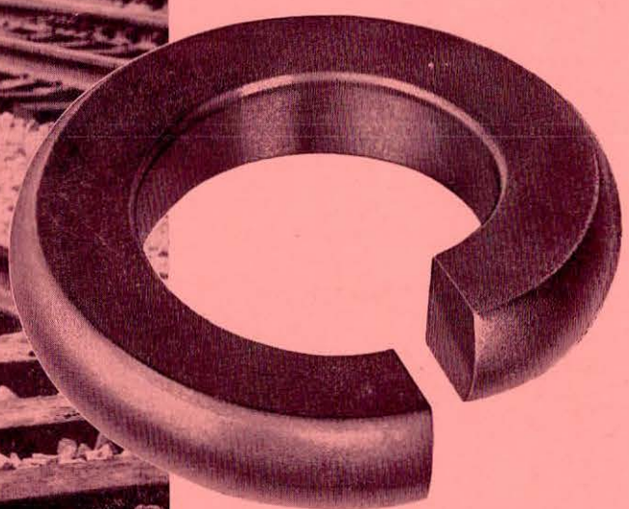

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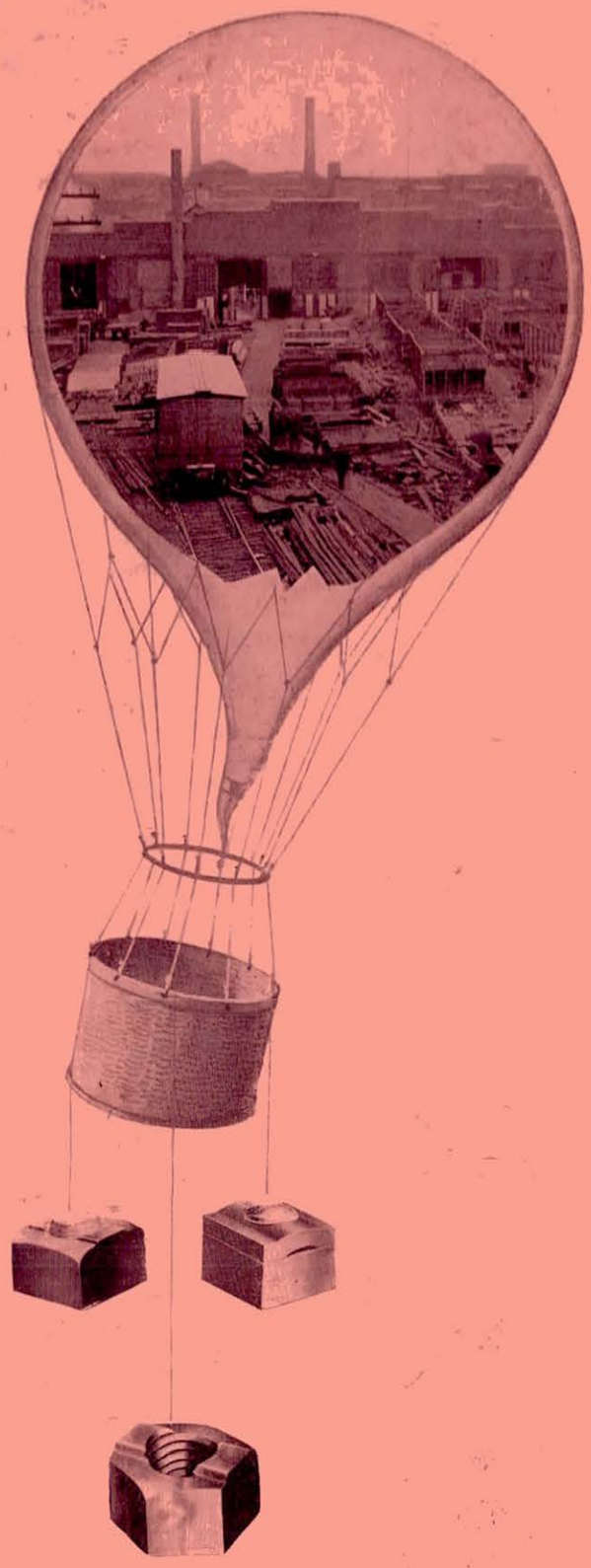

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